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CONVAIR MODEL 30

MAINTENANCE MANUAL

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FUEL

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CHAPTER 28

FUEL SYSTEM - DESCRIPTION AND OPERATION

1. General

The fuel system consists of five subsystems: Engine Fuel Supply, Refuel-Defuel, Fuel Jettison, Fuel Tank Vent, and Fuel Quantity Gaging. Fuel is stored in wing tanks integral with structure, in the four antishock bodies (ASB), and in fuel bags (cells) in the wing center section. A system of boost and transfer pumps control fuel distribution in the storage areas and deliver fuel to the engine-driven fuel pressure pumps mounted on the engines.

Pressure refueling adapters on the wing lower surfaces are used for refueling and defueling, and alternate gravity-flow refueling service openings are installed in the wing and ASB upper surfaces. Defueling is accomplished through the four pressure refueling adapters.

Hydraulically operated pumps in the system allow in-flight jettisoning of fuel. The jettison pumps in the auxiliary center section are also used to supply fuel to the engines.

Vent lines and valves in the system vent the tanks and adjust tank atmospheric pressures to the various conditions encountered in flight and on the ground. Inter-tank vent lines are used for fuel load equalizing in the tanks during refueling.

A capacitance-type fuel quantity gaging system indicates fuel load on indicators on the flight engineer's fuel control panel, on the pilots' instrument panel, and on refuel control panels located near the wing lower surfaces aft of the rear spars. In addition, liquid sight gages, located in the lower surfaces of the tanks are used for manually checking fuel load.

Most of the tubing for the fuel tank systems is contained within the fuel tank areas. The exceptions are the vent lines extending through the aft inboard side of each ASB, the lines to the jettison system discharge nozzles, and the supply lines extending through the pylons to the engines. The basic components of the fuel system are shown on Figure 1, and a system schematic is shown on Figure 2.

The five subsystems are as follows:

A. Engine Fuel Supply System.

The fuel supply for the four engines is stored within four wing tanks, one five-bay auxiliary tank in the wing center section, and four antishock body (ASB) auxiliary tanks. The tanks in the wings and in the ASB's are integral with structure; the five bays in the center section each contain a fuel bag (cell). Each wing tank is divided into a "main" and a "replenishment" section, and a "well" is located in the lowest point of each "main" section. Fuel from the ASB tanks is

transferred directly into the correspondingly numbered main tanks by transfer pumps. One transfer pump in the inboard replenish tanks and one in the inboard main tanks supply fuel directly to the boost pump wells in the inboard main tanks. Two transfer pumps in the outboard main tanks supply fuel directly to the boost pump wells in the outboard main tanks. Fuel from the inboard replenish tanks flows directly to the inboard main tanks through an opening in the bulkhead between them. Fuel from the outboard replenish tanks is transferred by gravity flow through two float-check valves to the outboard main tanks. Flapper-type check valves in the boost pump wells allow fuel to enter the wells from the main tanks in case of transfer pump malfunction. Hydraulically driven boost jettision pumps in the aft cell of the center section are located in sumps which are similar in function to the wells in the main tanks; these pumps are supplied by gravity flow, through check valves, from the forward cells. The boost-jettison pumps supply fuel from the center section tank to any engine via the crossfeed system, and also jettison fuel when one or both of two center section tank jettison valves is opened.

Drain valves for external draining, drain check valves for internal draining, and check valves for fuel control are installed throughout the tank systems.

The crossfeed part of the fuel supply system routes fuel from any main tank or from the center section tank to any or all engines. Selection is controlled by electrically-driven fuel shutoff valves installed on the rear spars. Low-pressure warning switches mounted on the rear spars are connected by tubing to each boost and transfer pump, and to the boost-jettison pumps.

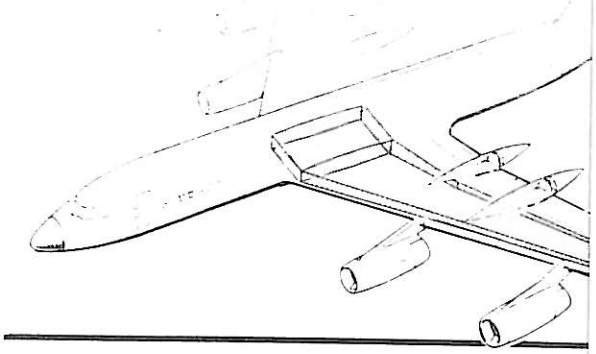
B. Refuel-Defuel System.

Pressure refueling is the normal method of refueling; two pressure refueling adapters in the lower surface of each wing are approximately 30 inches apart, and are located aft of the center spar and approximately midway between the wing tip and the outboard engine. The two adapters in each wing supply fuel to the various tanks through a common trunk line. When the engines are in operation and fuel level lowers in the tanks, a drain check valve adjacent to the adapters in each wing drains fuel from the trunk line, for use in engine operation. During defueling, an associated solenoid-operated shutoff valve in the drain check valve discharge line is closed, to maintain negative pressure created in the refuel trunk line by defueling tanker suction.

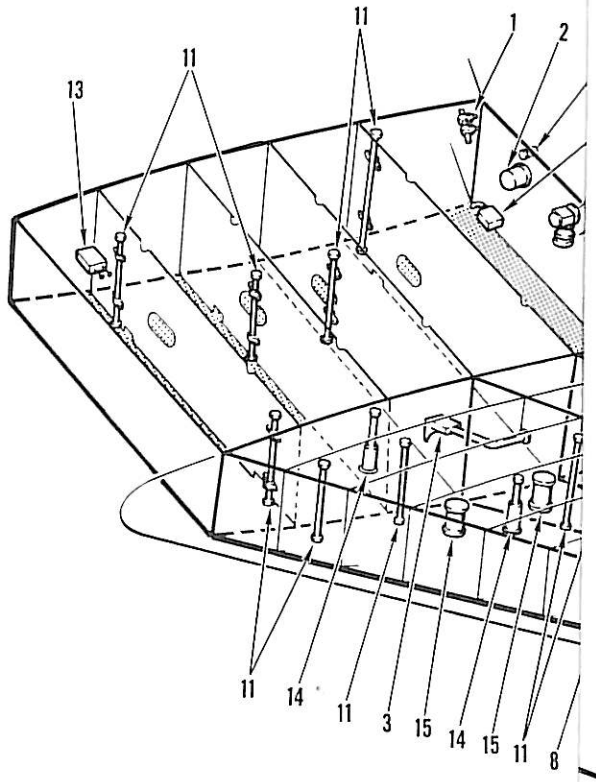
Four, three-inch fuel service opening into the replenishment tanks, accessible from the wing upper surfaces, allow alternate gravity-flow refueling. The auxiliary center section tank and the ASB tanks have similar service openings. The center section tank service opening is located on the upper surface of the left wing, over the No. 2 main tank; the ASB openings are on their upper surfaces.

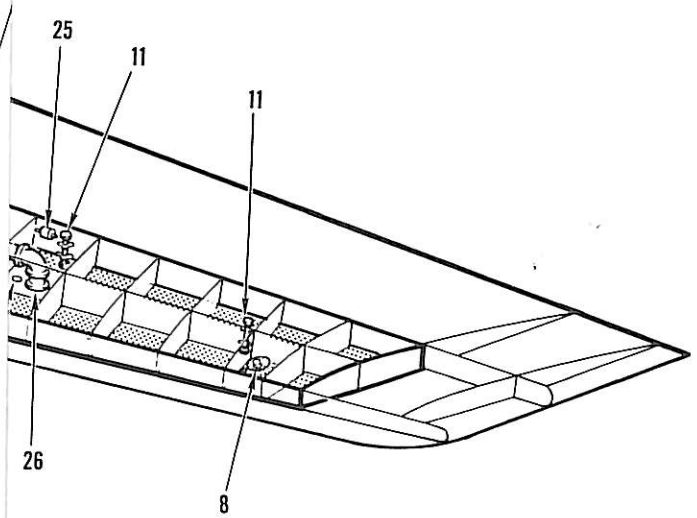
A refuel control panel on the aft side of the rear spar of each wing, between bulkheads 28 and 29, incorporates fuel quantity repeater gages, preset quantity selectors, precheck shutoff controls, * and a refueling

* Applicable to airplanes CV1 through CV25.



21. AUX CTR TANK JETTISON VALVE — L/H
22. JETTISON FUEL SHUTOFF VALVE
23. JETTISON NOZZLE
24. REFUEL CONTROL PANEL
25. REFUEL-DEFUEL TRUNK LINE VENT SHUTOFF VALVE— SOLENOID OPERATED
26. PRESSURE REFUEL ADAPTER
27. GROUND JACK
28. ENG. NO. 1 FUEL EMERGENCY SHUTOFF VALVE
29. ENGINE NO. 1 LINE (SHUTOFF) VALVE





NOTE:
L/H WING AND CENTER FUEL CELLS SHOWN — TYPICAL FOR R/H WING UNLESS OTHERWISE NOTED

30.02.25 034

NOTES:

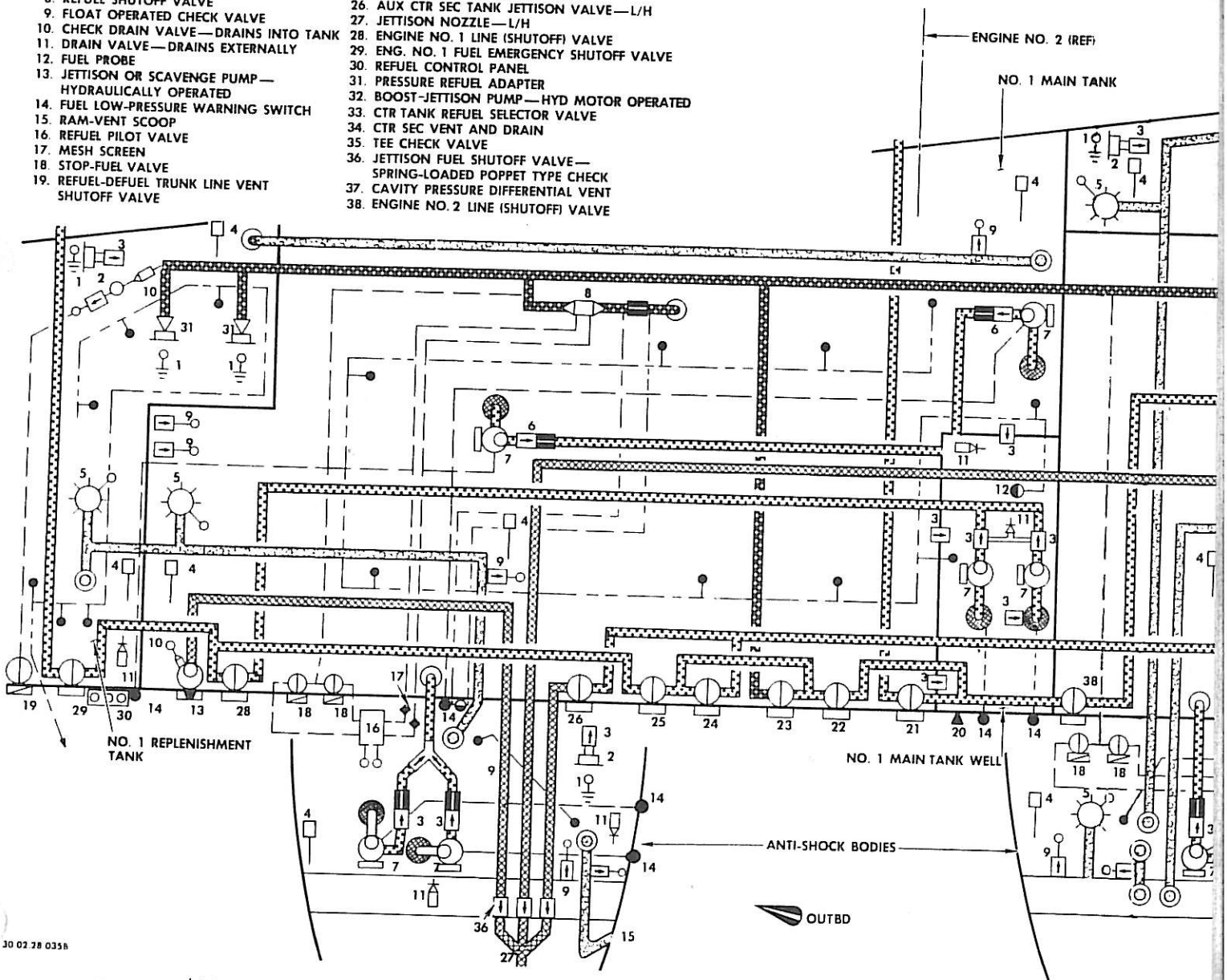
1. LH WING SHOWN — VIEW LOOKING DOWN
2. * SCREWS — REMOVABLE FOR DRAINING BAYS

LEGEND:

- FUEL
- REFUEL-DEFUEL
- JETTISON
- VENT
- FUEL
- FUEL SENSING
- ELECTRICAL

- GROUND JACK
- GRAVITY REFUEL ADAPTER
- CHECK VALVE
- DRIPSTICK
- VENT VALVE — FLOAT OPERATED
- CHECK VALVE WITH RESTRICTOR
- ** DIFFERENTIAL PRESSURE SWITCH

1. GROUND JACK
2. GRAVITY-FLOW REFUEL FILLER
3. CHECK VALVE—FLAPPER TYPE
4. LIQUID SIGHT GAGE
5. FLOAT OPERATED VENT VALVE
6. CHECK VALVE WITH RESTRICTOR
7. BOOST OR TRANSFER PUMP
8. REFUEL SHUTOFF VALVE
9. FLOAT OPERATED CHECK VALVE
10. CHECK DRAIN VALVE—DRAINS INTO TANK
11. DRAIN VALVE—DRAINS EXTERNALLY
12. FUEL PROBE
13. JETTISON OR SCAVENGE PUMP—HYDRAULICALLY OPERATED
14. FUEL LOW-PRESSURE WARNING SWITCH
15. RAM-VENT SCOOP
16. REFUEL PILOT VALVE
17. MESH SCREEN
18. STOP-FUEL VALVE
19. REFUEL-DEFUEL TRUNK LINE VENT SHUTOFF VALVE
20. TEMPERATURE GAGE
21. ENG. NO. 2 FUEL EMERGENCY SHUTOFF VALVE
22. ENGINE NO. 2 CROSSFEED VALVE
23. L/H DEFUEL VALVE
24. AUX CTR TANK & WING CROSSFEED VALVE
25. ENGINE NO. 1 CROSSFEED VALVE
26. AUX CTR SEC TANK JETTISON VALVE—L/H
27. JETTISON NOZZLE—L/H
28. ENGINE NO. 1 LINE (SHUTOFF) VALVE
29. ENG. NO. 1 FUEL EMERGENCY SHUTOFF VALVE
30. REFUEL CONTROL PANEL
31. PRESSURE REFUEL ADAPTER
32. BOOST-JETTISON PUMP—HYD MOTOR OPERATED
33. CTR TANK REFUEL SELECTOR VALVE
34. CTR SEC VENT AND DRAIN
35. TEE CHECK VALVE
36. JETTISON FUEL SHUTOFF VALVE—SPRING-LOADED POPPET TYPE CHECK
37. CAVITY PRESSURE DIFFERENTIAL VENT
38. ENGINE NO. 2 LINE (SHUTOFF) VALVE



Fuel System Schematic
Figure 2

BOOST OR TRANSFER PUMPS — AC MOTOR OPERATED

REFUEL SHUTOFF VALVE

CHECK VALVE — FLOAT OPERATED

VALVE, CHECK DRAIN, NORMALLY OPEN — FUEL PRESSURE CLOSED

DRAIN VALVE (EXTERNAL)

FUEL PROBES

JETTISON, SCAVENGE OR BOOST-JETTISON PUMP — HYD MOTOR OPERATED

FUEL LOW-PRESSURE WARNING SWITCH

FLUSH RAM VENT SCOOP

REFUEL PILOT VALVE

MESH SCREEN

DC SOL OPERATED VALVE — TYPICAL

DC MOTOR OPERATED VALVE — TYPICAL

TEMPERATURE GAGE

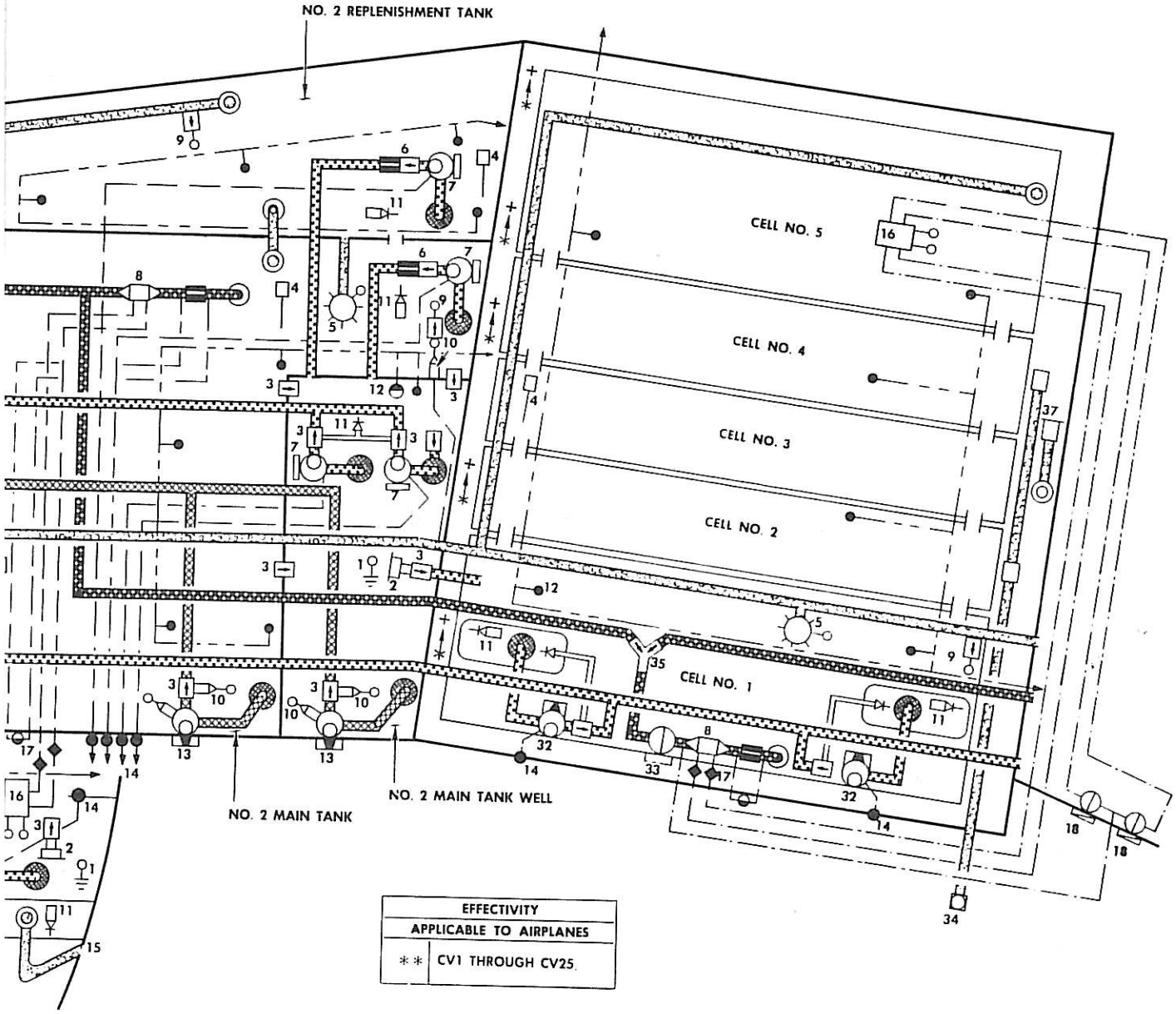
JETTISON NOZZLE

REFUEL CONTROL PANEL

PRESSURE REFUEL ADAPTER

VENT AND DRAIN

TEE CHECK VALVE



EFFECTIVITY	
APPLICABLE TO AIRPLANES	
**	CV1 THROUGH CV25

flow indicator light for each tank system. Jacks for microphones, handsets and headsets are installed for direct communication with the flight compartment and are normally used only during defueling operations; during refueling operations, personnel are not required in the flight compartment. A typical refuel control panel is shown on Figure 3.

Defueling is accomplished through any or all of the pressure refueling adapters on the wings by suction from the tanker. The defueling operation is controlled from the flight engineer's fuel control panel.

C. Fuel Jettison System.

The fuel jettison system allows in-flight weight reduction of the airplane down to the maximum permissible landing weight. A separate scavenging system can completely empty (scavenge) the inboard main tanks, and the boost-jettison pumps can completely empty (scavenge) the center section tank. The jettison pumps and boost-jettison pumps are hydraulically operated and electrically controlled. The jettison system is powered by the No. 1 hydraulic system; the scavenge jettison system by the No. 2 hydraulic system. The boost-jettison pumps are powered by both hydraulic systems: the left-hand pump by the No. 1 system; the right-hand pump by the No. 2 system.

Check drain valve assemblies allow fuel in the jettison lines to be used for engine operation, but are closed by line pressure during jettison operations to prevent fuel feedback to the tanks.

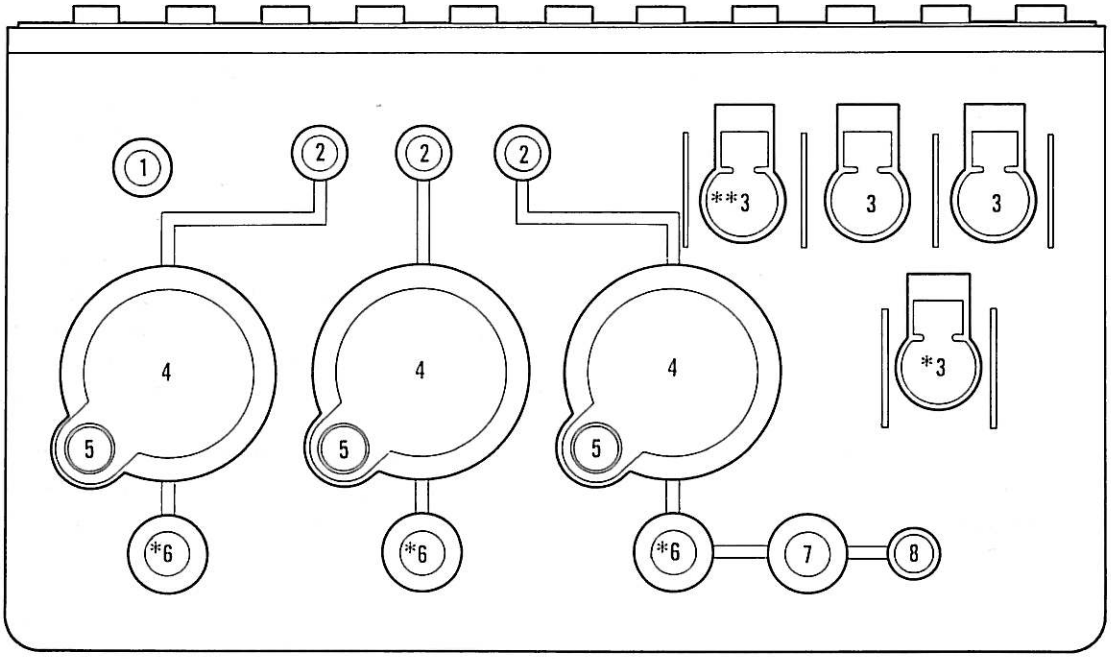
D. Fuel Tank Vent System.

The fuel tank vent system incorporates float-actuated vent valves, float-actuated vent valves with a pressure relief feature, and float-actuated check valves. The intertank vent pipes in the wing inboard and outboard tank systems also provide passage for the overflow of fuel from the main to the replenishment tanks, and from the replenishment tanks to the ASB tanks.

E. Fuel Quantity Gaging System.

The fuel quantity gaging system indicates fuel quantity for all of the tank systems. The null-balancing, capacitance type system uses probes and compensators located in the tanks. Five indicator gages are on the flight engineer's fuel control panel and three repeater indicator gages are on each of the two wing center spar refuel control panels. The repeater indicator gages reflect the readings on the corresponding indicators on the flight engineer's fuel control panel. The flight engineer's fuel control panel is shown on Figure 4. * A totalizer indicator on the pilots' center instrument panel shows the total amount of fuel in the airplane.

* Applicable to airplanes CV26 and on.



1. COMPARTMENT LIGHT SWITCH (DOOR-OPERATED).
2. REFUEL PRECHECK CONTROL SWITCH.
3. COMMUNICATIONS EQUIPMENT JACK.
4. FUEL QUANTITY REPEATER INDICATOR.
5. REFUEL QUANTITY PRESET CONTROL.
6. REFUELING STOPPED INDICATOR LIGHT.
7. CENTER SECTION SELECTOR VALVE OPEN INDICATOR LIGHT.
8. CENTER SECTION SELECTOR VALVE CONTROL SWITCH.

EFFECTIVITY	
APPLICABLE TO AIRPLANES	
*	CV1 THROUGH CV25
**	CV26 AND ON

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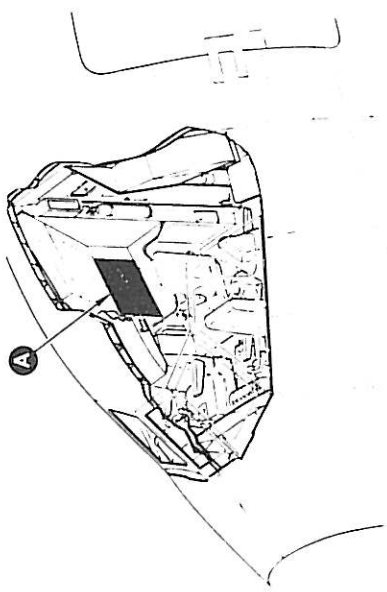
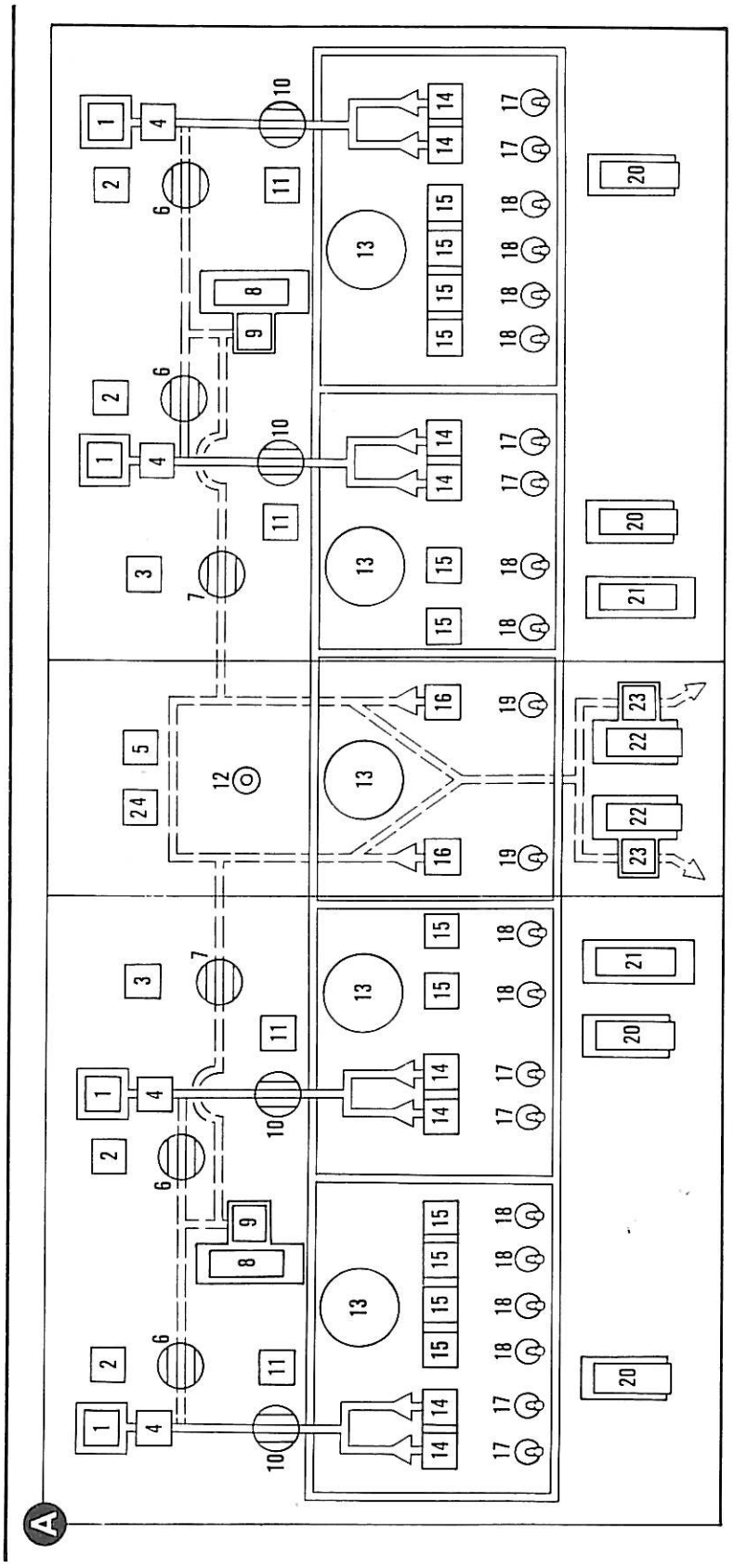


1. ENGINE FUEL PUMP LOW PRESSURE WARNING LIGHT.
2. CROSSFEED VALVE IN-TRANSIT LIGHT.
3. AUX CTR TANK & WING CROSSFEED VALVE IN TRANSIT LIGHT.
4. EMERGENCY FUEL SHUTOFF VALVE CLOSED LIGHT.
5. OUTBOARD ANTI-SHOCK BODY EXCESS FUEL LIGHT.
6. CROSSFEED VALVE CONTROL SWITCH.
7. AUX CTR TANK & WING CROSSFEED VALVE CONTROL SWITCH.
8. DEFUEL VALVE CONTROL SWITCH.
9. DEFUEL VALVE OPEN LIGHT.
10. LINE VALVE CONTROL SWITCH.
11. LINE VALVE IN-TRANSIT LIGHT.
12. FUEL QUANTITY SELECTOR SWITCH.
13. FUEL QUANTITY INDICATOR.
14. BOOST PUMP LOW PRESSURE WARNING LIGHT.
15. TRANSFER PUMP LOW PRESSURE WARNING LIGHT.
16. BOOST-JETTISON PUMP LOW PRESSURE WARNING LIGHT.
17. BOOST PUMP CONTROL SWITCH.
18. TRANSFER PUMP CONTROL SWITCH.
19. BOOST-JETTISON PUMP CONTROL VALVE SWITCH.
20. JETTISON PUMP CONTROL VALVE SWITCH.
21. JETTISON-SCAVENGE PUMP CONTROL VALVE SWITCH.
22. CENTER TANK JETTISON VALVE CONTROL SWITCH.
23. CENTER TANK JETTISON VALVE OPEN LIGHT.
24. OUTBOARD ANTI-SHOCK BODY PUMP OFF LIGHT.



In addition to the electrical gaging system, there are a total of 21 liquid sight gages, used for manually checking tank fuel levels. Eight of the gages are located in the lower surface of each wing; one is in the center section tank, and there is one in each ASB tank.

FUEL TANKS - DESCRIPTION AND OPERATION

1. General

All fuel tanks except the center section fuel cells and the anti-shock body compartments are built as part of the basic airplane structure. The wings and ASB tanks are sealed by the "Scotchweld" process during assembly. A trap compartment in each inboard ASB is located aft of the fuel compartment. The wing center section tank is made up of five fuel-tight cells, each a two-ply nylon fabric bag impregnated with buna-N rubber. The airplane structure supports the bags, with the bags held in place by nylon cords attached alternately to the bags and to structure at approximately 15 inch spacing. Plumbing fittings in the center section are all flat faced, with gask-O-seal type seals, and are supported by the structure through sandwiching of fittings, seal, bag, and structure. Interconnect fittings allow free flow of fuel from one cell to another. An open drain line and a drain valve drain moisture from the center section area outside the fuel cells. Also, a screw in the skin of each of the four front bays may be removed to drain moisture.

The outboard replenishment tanks are located outboard of their respective main tanks; the inboard replenishment tanks are forward of their respective main tanks, between the wing front spar and center spar as shown on Figure 1. The total tank areas extend from the closing rib at wing bulkhead 36 left-hand, through the wing center section to wing bulkhead 36 right-hand, and from the front spars to the rear spars. The outboard and inboard main tanks divide at wing bulkhead 8; the inboard tanks and the center section tank divide at wing bulkhead 1. The anti-shock bodies, which house auxiliary fuel for the main tanks, are mounted on the upper aft surfaces of the wings, two on each wing, at wing bulkheads 7 and 16.

All sealed internal joints in the tanks are accessible through a total of 36 openings in the lower surfaces of the wings, plus openings in the tanks for crawl access. Joints and internal structure of the center section tank are accessible through an opening in the left side of the rear spar, forward in the left-hand main wheel well. Access doors are located in each of the ASB tanks. Tank access provisions are shown on Figure 2.

Total fuel capacity of the fuel tanks is as follows:

(Applicable to airplanes CV1, CV2, and CV5 through CV24.) 15,173 US gallons (12,634 IMP gallons -- 57,430 liters).
(Applicable to airplanes CV3, CV4 and CV25.) 15,708 US gallons (13,080 IMP gallons -- 59,455 liters).
(Applicable to airplanes CV26 through CV34.) 15,635 US gallons (13,019 IMP gallons -- 59,178 liters).
(Applicable to airplanes CV35 and on). 15,708 US gallons (13,080 IMP gallons -- 59,455 liters).

The expansion space left in each tank system, with a full fuel load, is shown below as a percentage of the total fuel volume of the tank system:

(Applicable to airplanes CV1, CV2, and CV5 through CV24.)

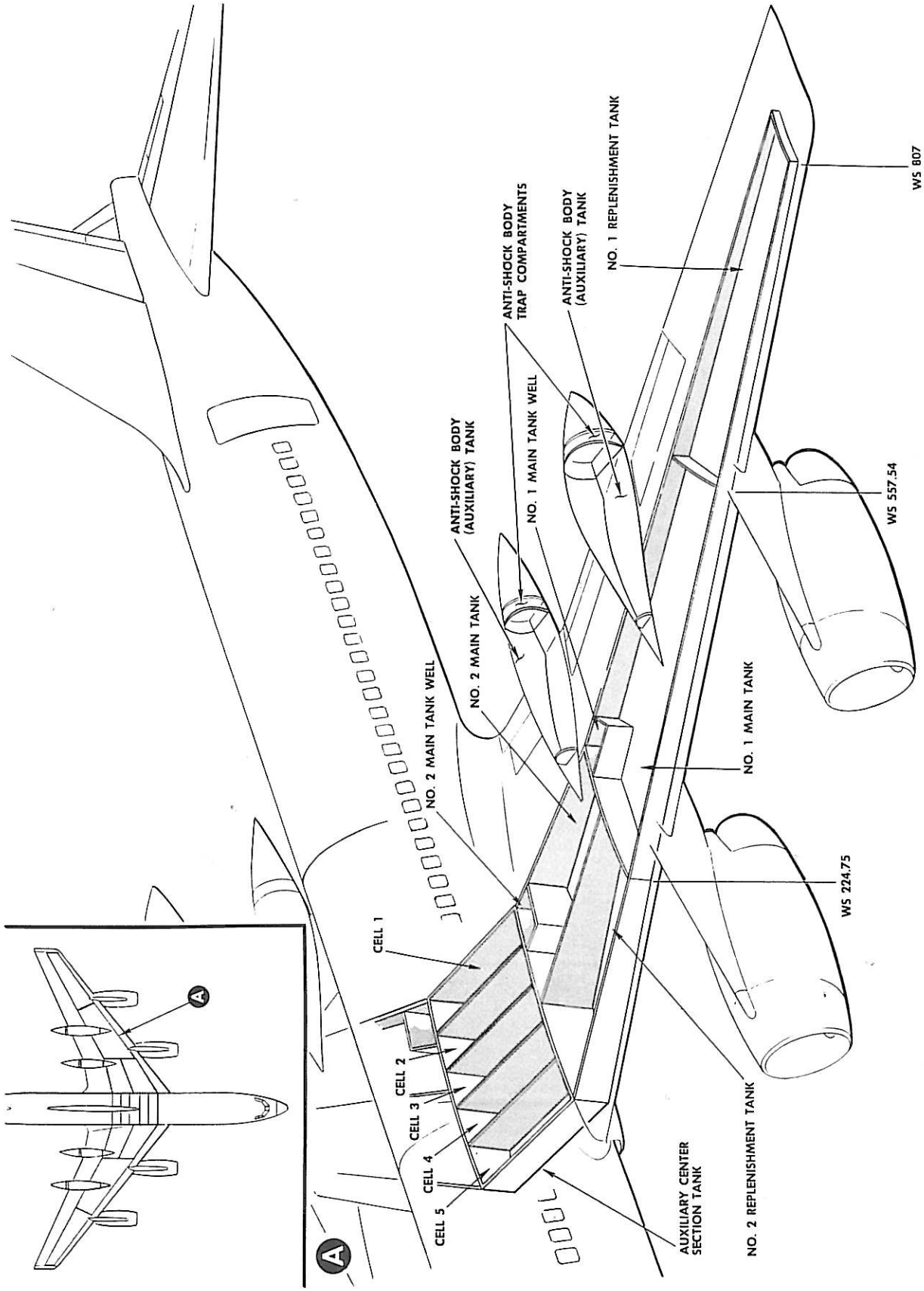
Outboard main and replenishment tanks plus outboard ASB . . .	9.4 percent
Inboard main and replenishment tanks plus inboard ASB	3.0 percent
Center tank (total volume of the five cells)	4.6 percent

(Applicable to airplanes CV3, CV4, CV25, and CV35 and on.)

Outboard main and replenishment tanks plus outboard ASB . . .	3.1 percent
Inboard main and replenishment tanks plus inboard ASB	3.0 percent
Center tank (total volume of the five cells).	4.5 percent

(Applicable to airplanes CV26 through CV34.)

Outboard main and replenishment tanks plus outboard ASB . . .	3.1 percent
Inboard main and replenishment tanks plus inboard ASB	3.0 percent
Center tank (total volume of the five cells).	4.6 percent


WS 807
NO. 1 REPLENISHMENT TANK
ANTI-SHOCK BODY TRAP COMPARTMENTS
ANTI-SHOCK BODY (AUXILIARY) TANK
NO. 1 MAIN TANK WELL
ANTI-SHOCK BODY (AUXILIARY) TANK
NO. 2 MAIN TANK
WS 557.54
NO. 2 MAIN TANK WELL
NO. 1 MAIN TANK
WS 224.75
CELL 1
CELL 2
CELL 3
CELL 4
CELL 5
AUXILIARY CENTER SECTION TANK
NO. 2 REPLENISHMENT TANK
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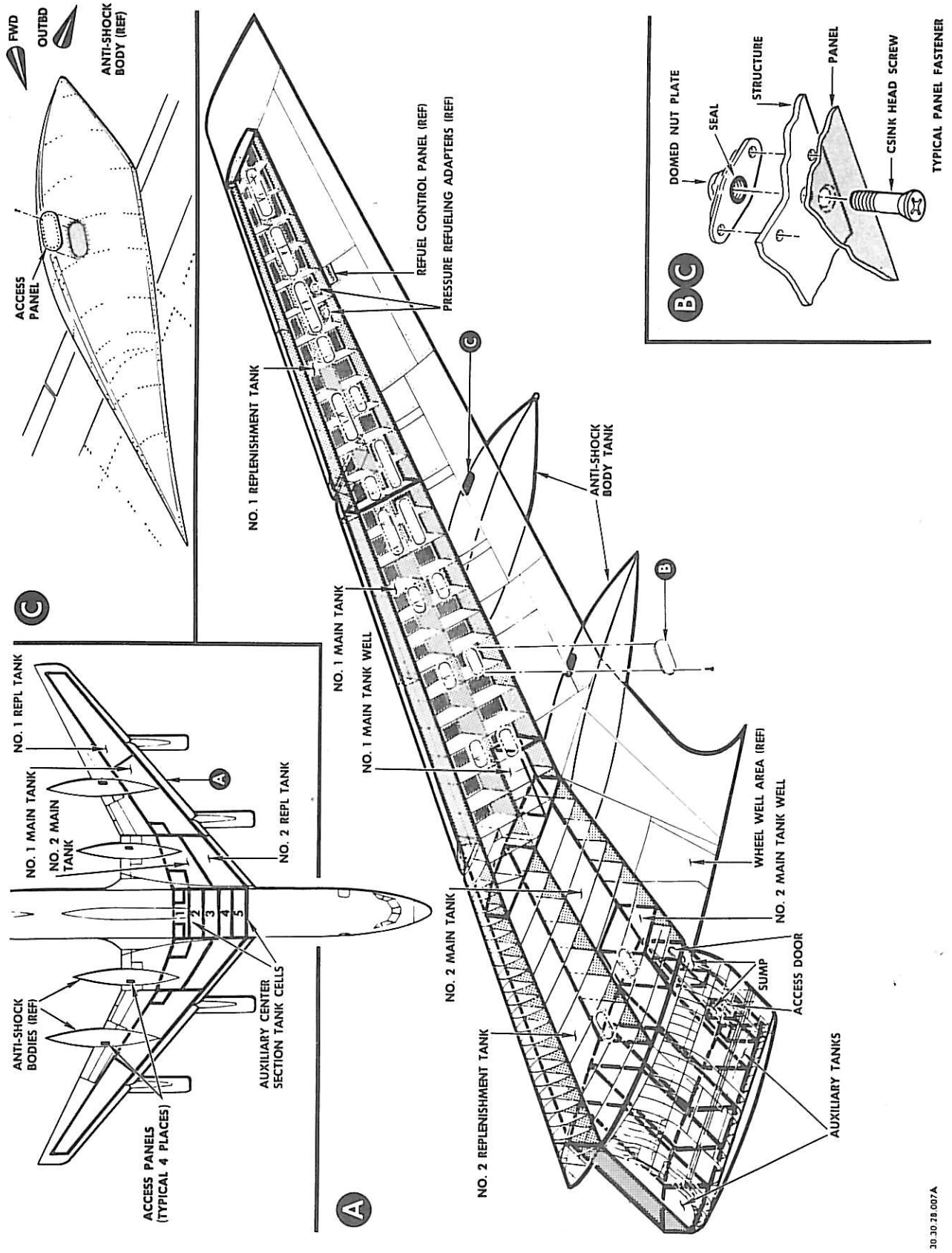


Fuel Tank Access Panels
Figure 2

FUEL SYSTEM - MAINTENANCE PRACTICES

1. Removal/Installation Flex Coupling (see Figure 201)

A. General.

Adherence to the following procedures will enable assembling of Wiggins flex couplings in the shortest time and will assure a leakproof connection. Some installations may require a gap between tube ends different than that given here. In such cases the correct gap will be given in the assembly procedure for the unit attaching to that particular Wiggins coupling.

B. Assemble Wiggins Coupling.

(1) Check that gap between tube ends does not exceed 0.25-inch.

(2) Apply petrolatum, Specification VV-P-236, or equivalent to the coupling body and lightly coat the O-rings, seal retaining washer, seal retaining collar, and tube retainer.

(3) Slide coupling body, seal retaining washer and O-ring, in that order, over end of one tube.

(4) Slide coupling nut, seal retaining collar, and O-ring, in that order, over end of other tube.

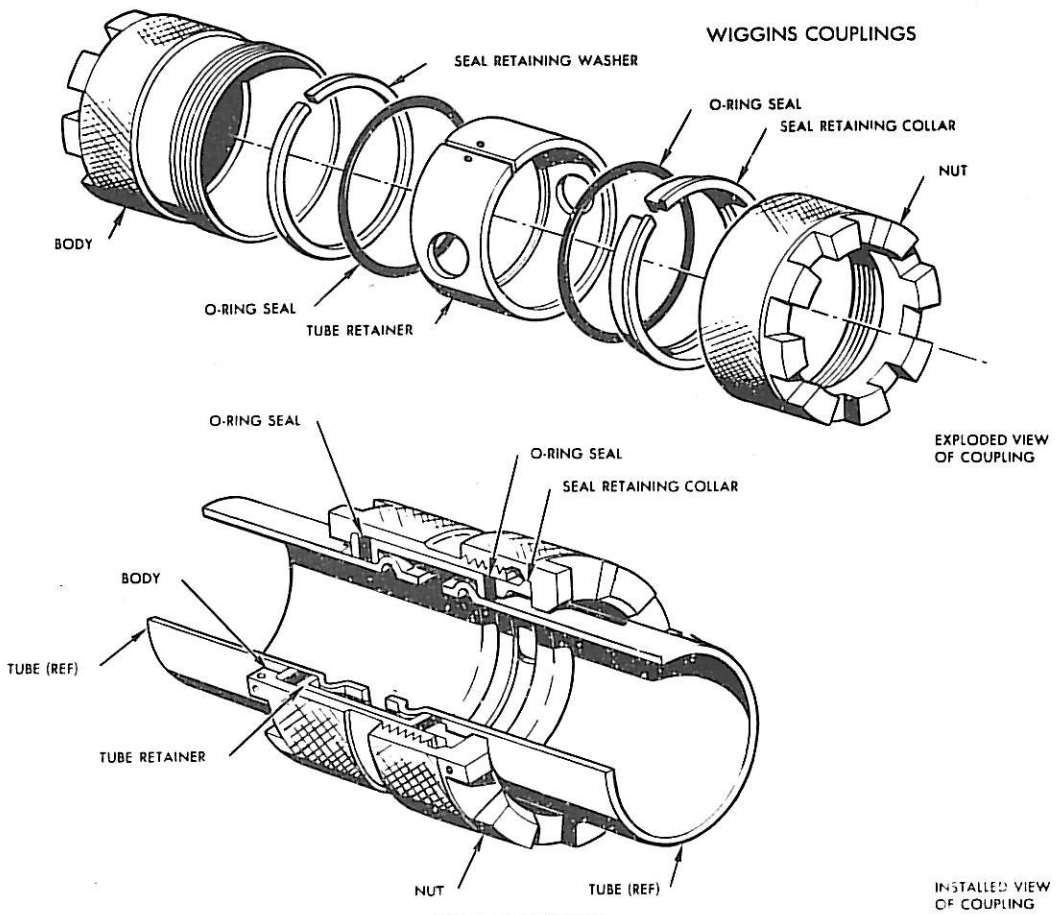
(5) Position tube retainer over bead of each tube. Exercise care to prevent damage to tube and bead.

(6) Slide coupling nut and body toward each other and engage threads.

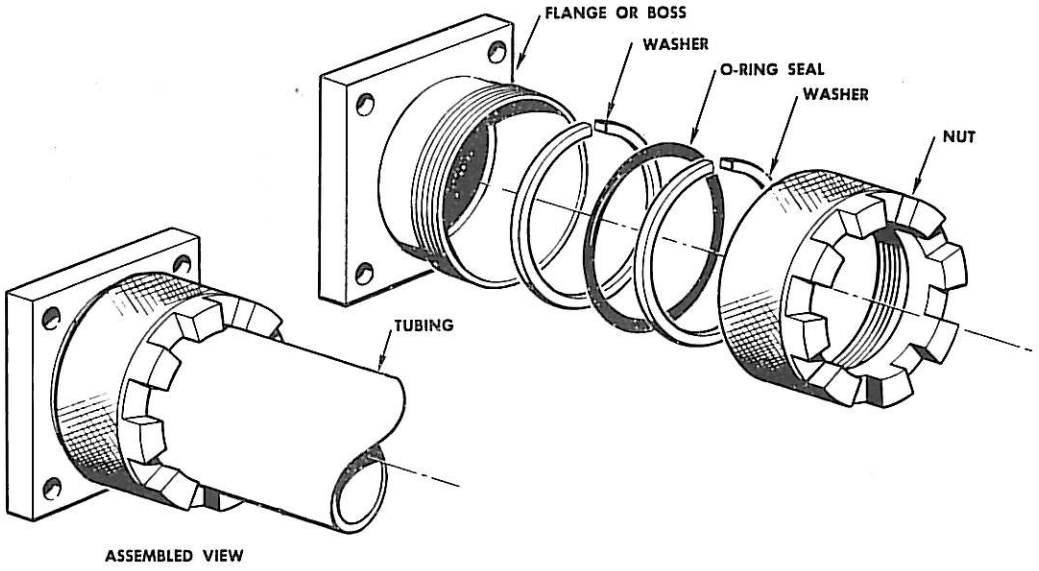
(7) Using spanner srench, hold coupling body. Using a combination spanner wrench and torque wrench, turn nut until the following torque is obtained:

Tube Size (OD) (inches)	Torque Value (Foot-pounds)
1	6 to 9
1½	14 to 17
2	25 to 28
2½	32 to 35

(8) For added security, safety wire nut to body.



FULL COUPLING



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BOSS COUPLING

FUEL TANKS - MAINTENANCE PRACTICES

1. Servicing - Purging Fuel Tanks

A. General.

The flash point of kerosene is 110 degrees F (43.3 degrees C); the flash point of JP-4 is +80 degrees F (+26.7 degrees C). Vapors from a tank or anti-shock body that has contained fuel are both explosive and toxic.

WARNING: THE PRECAUTIONS AGAINST EXPLOSIONS AND TOXIC INJURY TO PERSONNEL OUTLINED IN THE FOLLOWING PROCEDURES ALSO APPLY WHEN MAINTENANCE IS PERFORMED OUTSIDE AN OPEN TANK OR ASB NEAR VAPORS EMITTING FROM THE OPENING. THE TANK OR ASB SHOULD IN THESE CASES BE INERTED.

B. Equipment Required.

(1) Fuel tank servicing cart capable of supplying filtered breathing air to personnel inside tank. The cart will contain the necessary controls and gages, spare emergency air bottles with quick-disconnect fittings, and demand type air-line respirators with full face mask affording eye protection.

(2) Source of nitrogen or carbon monoxide gas.

(3) Rubber or neoprene gloves.

(4) Properly identified plastic containers and funnels for draining fuel from tanks.

(5) Accessory Products Co. drain tool No. 704400 with plastic bottle.

(6) Explosion proof flashlights, drop cords and floodlights for night operations.

(7) Oxygen content analyzer (Vapotester), or combustible gas indicator (Explosimeter, Model 2, Mine Safety Appliance Co.).

(8) Cotton wearing apparel items: sweat shirt, sweat pants, thermo socks, and cotton cap.

(9) Lint free cotton rags and/or cellulose sponges.

(10) Air mover (air blower-exhauster).

C. Prepare to Inert Tank.

WARNING: PERSONNEL MUST OBSERVE THE FOLLOWING PRECAUTIONS AND PROCEDURES BEFORE ENTERING A TANK.

(1) Defuel applicable tank; refer to Chapter 12, SERVICING.

(2) Position airplane in an area which allows free movement of fire fighting and other emergency equipment.

(3) Notify fire equipment personnel of intent to enter a fuel tank.

(4) Disconnect all electrical power from airplane; refer to Chapter 24, ELECTRICAL POWER.

(5) Disconnect airplane battery (refer to Chapter 24, ELECTRICAL POWER) and attach a sign reading: DO NOT CONNECT.

(6) Ground airplane to approved ground points. Refer to Chapter 10, PARKING AND MOORING.

(7) Rope off airplane for a distance of 50 feet (radius) from tank area, and post signs reading: OPEN FUEL TANK.

NOTE: Make allowance for prevailing wind conditions.

D. Inert Fuel Tank.

(1) Drain residual fuel from tank using tool No. 704400 with plastic bottle. Use larger container with funnel if required. Refer to 28-3-0, Figure 9 for locations of drain valves.

WARNING: IF METAL CONTAINERS AND FUNNELS ARE USED, GROUND THEM TO THE AIRPLANE.

(2) Position nitrogen or CO_2 cart and insert discharge end of hose into applicable overwing or ASB refueling filler fitting.

NOTE: The four overwing fillers for the wing tanks lead to the four replenishment tanks. To purge a main tank, insert hose into filler fitting of the main tank's associated replenishment tank. The inert gas will flow from replenishment tank to main tank through the tank system vent tube.

(3) Start inert gas flow and periodically take tank oxygen content reading with oxygen content analyzer (Vapotester or Explosimeter). To do this, shut off gas flow, remove nozzle from filler fitting, and insert sniffer in filler fitting.

(4) Continue inert gas flow into tank until the oxygen content in tank is reduced to 10 percent or less by volume. The tank access door(s) may then be removed.

(5) After removing access door(s), transfer inert gas hose from filler fitting to access door opening. Place hose discharge end as far as possible from tank opening to assure good distribution of inert gas in tank.

(6) Continue inert gas flow while preparing to enter tank.

E. Prepare to Enter Fuel Tank.

(1) Remove all metallic articles, (rings, watches, etc.) and tools from pockets and person; remove all silk, woolen, or nylon outer clothing; don sweat shirt, sweat pants, thermo socks, cotton cap, and rubber or neoprene gloves.

NOTE: Remove shoes and put on thermo socks just before entering. Socks must be clean when entering.

(2) Connect and place two standby respirators near tank entrance.

(3) Put on respirator and check operation. Check emergency air bottles for content and operation.

(4) Attach a safety line to waist of person(s) entering tank and agree on signals to be used.

(5) Persons entering tank shall discharge static electricity from their bodies by contacting one of the ground connections with their hands before touching tank opening.

F. Enter Tank and Mop Up Residual Fuel.

WARNING: CONTINUE FLOW OF INERT GAS INTO TANK DURING MOPPING UP PROCESS.

(1) One man shall enter tank while a second man stands outside with his head in tank opening to observe any distress signal shown by man inside tank. Take every precaution to prevent dirt or foreign matter from entering tank.

WARNING: IF IT IS NECESSARY TO TAKE METALLIC TOOLS INTO TANK, CARRY TOOLS IN A COTTON BAG OR POUCH. DO NOT DROP TOOLS INTO CONTAINER, WHERE CONTACT WITH OTHER TOOLS MAY CAUSE A SPARK. KEEP TOOLS IN CONTAINER WHEN NOT IN USE. SPARKPROOF TOOLS ARE RECOMMENDED.

(2) Absorb residual fuel by spreading lint-free rags over bottom of tank. Count rags before taking into tank, and again after all rags are removed. Make sure the number is the same.

WARNING: DO NOT REMOVE RESPIRATOR WHILE IN TANK CONTAINING INERTING GAS. UNCONSCIOUSNESS FOLLOWED BY DEATH WILL RESULT IN A SHORT TIME DUE TO LACK OF OXYGEN.

(3) Cap or seal tank vent tube bellmouths and any other openings that would allow vapors to flow into tank from adjoining tanks.

(4) Shut off inert gas supply and remove hose.

G. Ventilate Fuel Tank.

(1) Position air mover and ground to an approved ground point.

NOTE: If tank has more than one access door, use two air movers and place their discharge nozzles at opposite ends of tank.

(2) Open overwing fueling filler fitting to aid air circulation through tank.

(3) Supply air pressure to air mover(s) and start airflow.

(4) Continue tank ventilation until an explosion meter test shows tank to be nonexplosive, and Vapotester shows tank to be noninjurious to health. When this condition is achieved, personnel may be permitted to work inside tank without an air-line respirator.

WARNING: VENTILATION MUST CONTINUE WHILE PERSONNEL ARE WORKING INSIDE TANK WITHOUT AN AIR-LINE RESPIRATOR. OBSERVE PRECAUTIONS OUTLINED IN DRY FUEL TANK ENTRANCE PRECAUTIONS BEFORE ENTERING A DRY TANK.

2. Servicing - Dry Fuel Tank Entrance Precautions

WARNING: A DRY FUEL TANK RETAINS AN EXPLOSIVE AND TOXIC VAPOR. BEFORE ENTERING A DRY TANK, VENTILATE TANK PROPERLY (REFER TO 1.G.) AND OBSERVE THE FOLLOWING PRECAUTIONS. RE-CHECK TANK WITH EXPLOSIMETER AFTER IDLE TIME PERIODS WHEN VENTILATION IS SHUT OFF.

A. Equipment Required.

(1) Air mover (air blower-exhauster).

(2) Explosion proof flashlights, drop cords, and floodlights for night operations.

B. Prepare to Enter Dry Fuel Tank.

(1) Remove all metallic articles (rings, wristwatch, etc.) and tools from person.

(2) Put on clean coveralls or similar clothing. Check that pant cuffs are free of all foreign material.

NOTE: Remove shoes and put on cover socks just before entering tank. Avoid picking up metal shavings, chips, or other foreign material with socks from ground or stand while entering tank.

(3) Discharge static electricity from person by contacting one of the ground connections with hands before touching tank opening.

C. Enter Dry Fuel Tank.

WARNING: CARRY TOOLS INTO TANK IN A COTTON BAG OR POUCH. DO NOT DROP TOOLS INTO CONTAINER WHILE IN TANK, AND KEEP TOOLS IN CONTAINER WHILE NOT IN USE. AVOID CONTACTING TOOLS TO WORK OR SURROUNDING AREA IN A MANNER THAT COULD CAUSE SPARKING. SPARKPROOF TOOLS ARE RECOMMENDED.

(1) Enter tank. While in tank, observe the following rules:

(a) Do not use electric power tools in tank. Use air-driven power tools only.

(b) Do not use electrical testing equipment which can produce a spark.

(c) Exercise care to prevent damage to any wiring inside tank.

(d) Eliminate unnecessary trips in and out of tank.

(2) When work has been completed, remove all tools, equipment, rags, etc., and make certain tank is free of dirt or other foreign matter. Count rags to make sure that all have been accounted for. Replace tank access doors.

(3) Remove warning tags from external power connection, and from battery; connect battery (refer to Chapter 24, ELECTRICAL POWER).

(4) Refuel tank; refer to Chapter 12, SERVICING.

WARNING: THE PRECAUTIONS AGAINST EXPLOSIONS AND TOXIC INJURY TO PERSONNEL OUTLINED ABOVE ALSO APPLY WHEN MAINTENANCE IS PERFORMED OUTSIDE AN OPEN TANK OR ASB NEAR VAPORS EMITTING FROM THE OPENING. THE TANK OR ASB SHOULD IN THESE CASES BE INERTED.

3. Inspection/Check Integral Fuel Tanks - Visual Check for Leaks

A. Equipment Required - None.

B. Fuel Leak Classification.

Fuel tank leaks are classified as follows:

(1) STAIN - A dry, discolored area.

(2) SEEP - A wet, discolored area.

(3) DRIP - Free droplets.

(4) RUN - A continuous stream.

C. Fuel Leak Causes.

Most fuel leaks will be in the area of the fuel tank doors. This type leak is caused by one of the following:

(1) Damaged seal.

(2) Damaged dome nut or dome nut O-ring.

(3) Loose screws.

D. Determining Leak Source.

Because of the seeping characteristics of JP-4 fuel, evidence of leakage may be seen at points some distance away from the actual leaking point. Accurate pin-pointing of the leak point will aid in determining whether the cause is a screw, seal, etc. Proceed as follows to locate the leak point:

(1) Wipe clean all fuel seepage.

(2) Check for new seepage and alternately wipe and observe seepage until it is traced to the leak point. Be sure to carefully wipe the gap area between door and adjacent skin; a leaking seal will show up at this point.

(3) When leak point has been located, and type of leak determined, refer to Approved Repairs for Repair procedure.

NOTE: If leak cannot be located by the preceding procedure, refer to Chapter 57, WINGS, which outlines a leak test procedure using air.

4. Cleaning/Painting - Fuel Tank Cleaning Procedure

A. General.

A fuel tank must be properly cleaned after any maintenance has been accomplished inside the tank. It is very important that all contaminants, especially lint, be removed to prevent clogging of filters.

B. Equipment Required - Tack rags.

C. Clean Fuel Tank.

WARNING: OBSERVE ALL TANK ENTRANCE PRECAUTIONS.

(1) Persons entering tank shall wear clothing as lint free as possible, preferably clean cotton (no wool sweaters, etc.).

(2) Brush lint off shoes and clothing before entering tank.

(3) Enter tank and remove all metallic particles and other foreign matter.

(4) Wipe all tank interior surfaces, fuel lines and other components with tack rag to remove lint and dust.

(5) Replace tank access panels.

5. Approved Repairs - Integral Fuel Tank Leaks

A. Equipment Required. EC 776 and EC 1293.

B. Repair Leaking Tank Access Door Seal. The fuel tank access door seals cannot be successfully repaired. Whenever a door seal is leaking replace the door.

C. Repair Fuel Tank Access Door Screw Leak.

Whenever leakage apparently comes from an access door screw, the leakage is probably due to a leaking dome nut inside the tank. If the leak is very minor, a temporary repair may be made as follows:

(1) Lightly coat replacement screw of correct length with compound EC 776, Type I.

CAUTION: A SCREW THAT IS TOO LONG WILL DAMAGE THE DOME NUT.

(2) Allow compound to dry until tack free.

(3) Remove leaking screw and install compound coated screw.

D. Repair Leaking Dome Nut.

(1) Defuel applicable tank; refer to Chapter 12, SERVICING.

(2) Purge tank; refer to Purging Fuel Tank.

CAUTION: OBSERVE ALL TANK ENTRANCE PRECAUTIONS.

(3) Remove existing sealant coating from dome nut.

(4) Coat dome nut with EC 1293 and allow to dry until sealant is firm and rubbery to the touch.

(5) Apply a coat of EC 776 and allow to dry completely tack free.

(6) Clean fuel tank; refer to Cleaning/Painting.

NOTE: If dome nut replacement or other repairs are required, refer to Chapter 57, WINGS, for procedure.

(7) Refuel tank; refer to Chapter 12, SERVICING.

CENTER TANK FUEL CELLS - MAINTENANCE PRACTICES

1. Removal/Installation Center Tank Fuel Cells

A. General.

The fuel cells are installed in cavities in the fuselage, between the front and rear spars. The cavities are separated by auxiliary spars which are numbered from forward aft, 1, 2, 3, and 4. Fuel cells are installed in the cavities, and the cells are numbered 1, 2, 3, 4, and 5, from aft forward, cell No. 1 being between the rear spar and auxiliary spar No. 4. The fuel cells are supported in the cavities by nylon lacing cords, strung through lacing tabs on the cells and support fittings on the structure. The cords are knotted as shown on Figure 201. The cells are also attached to structure through cell fittings which support equipment inside the cells.

WARNING: OBSERVE ALL TANK ENTRANCE PRECAUTIONS OUTLINED IN 28-1-0 BEFORE ENTERING CELLS.

B. Fuel Cell Handling Precautions.

Extreme care must be exercised when removing or installing fuel cells, as they are easily damaged. The following handling instructions must be complied with:

(1) Keep fuel cell in shipping crate, package, or container until required. Do not stack unpacked cells.

(2) Before removing cell from crate, carefully check crate for nails, slivers, or any other sharp objects that could damage the cell.

(3) Do not drag cell across floor, or use cell fittings for lifting. Carry cell from one location to another in folded condition.

(4) Unfold or fold cell on a smooth clean surface larger than the cell.

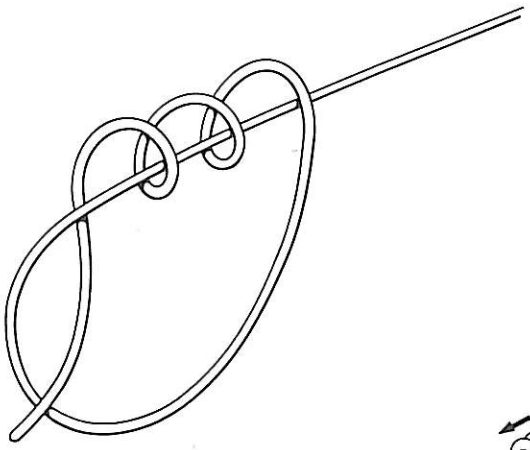
(5) When folding cell into a package small enough to pass through access opening, or for storage purposes, proceed as follows:

(a) Fold forward and aft sides of cell inward, approximately along center.

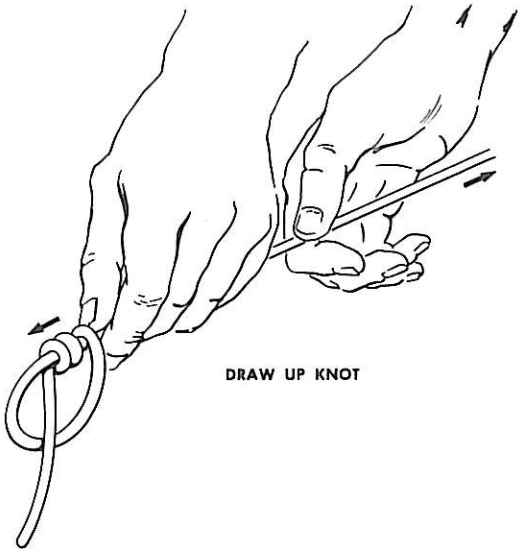
(b) Fold once more along top or bottom side.

CAUTION: DO NOT FOLD A CELL ABUSIVELY OR UNNECESSARILY. DO NOT FOLD ACROSS OR BESIDE ANY FITTING.

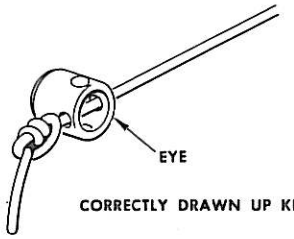
(6) Fold and tie cell just prior to inserting or removing from airplane cavity.



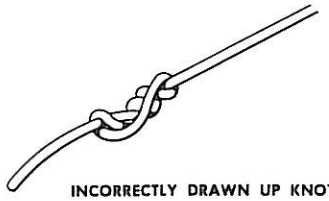
LOOP THE CORD 6 INCHES (APPROXIMATELY) AND PASS THE END THROUGH THE LOOP THREE TIMES.



DRAW UP KNOT

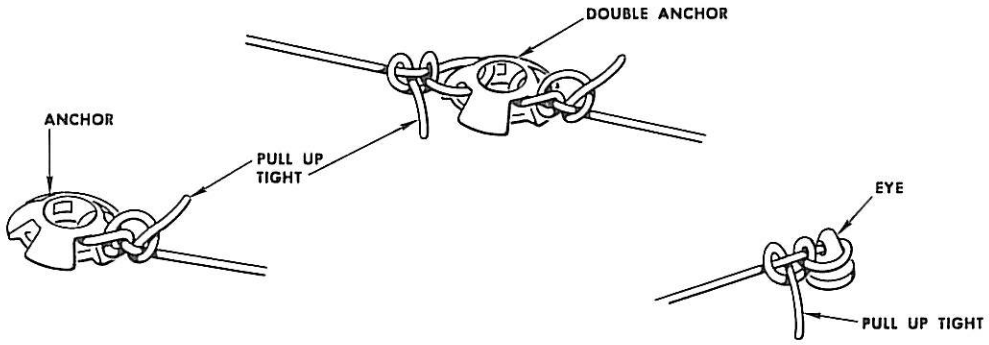


CORRECTLY DRAWN UP KNOT



INCORRECTLY DRAWN UP KNOT

ANCHOR KNOTS



TIE-OFF KNOTS

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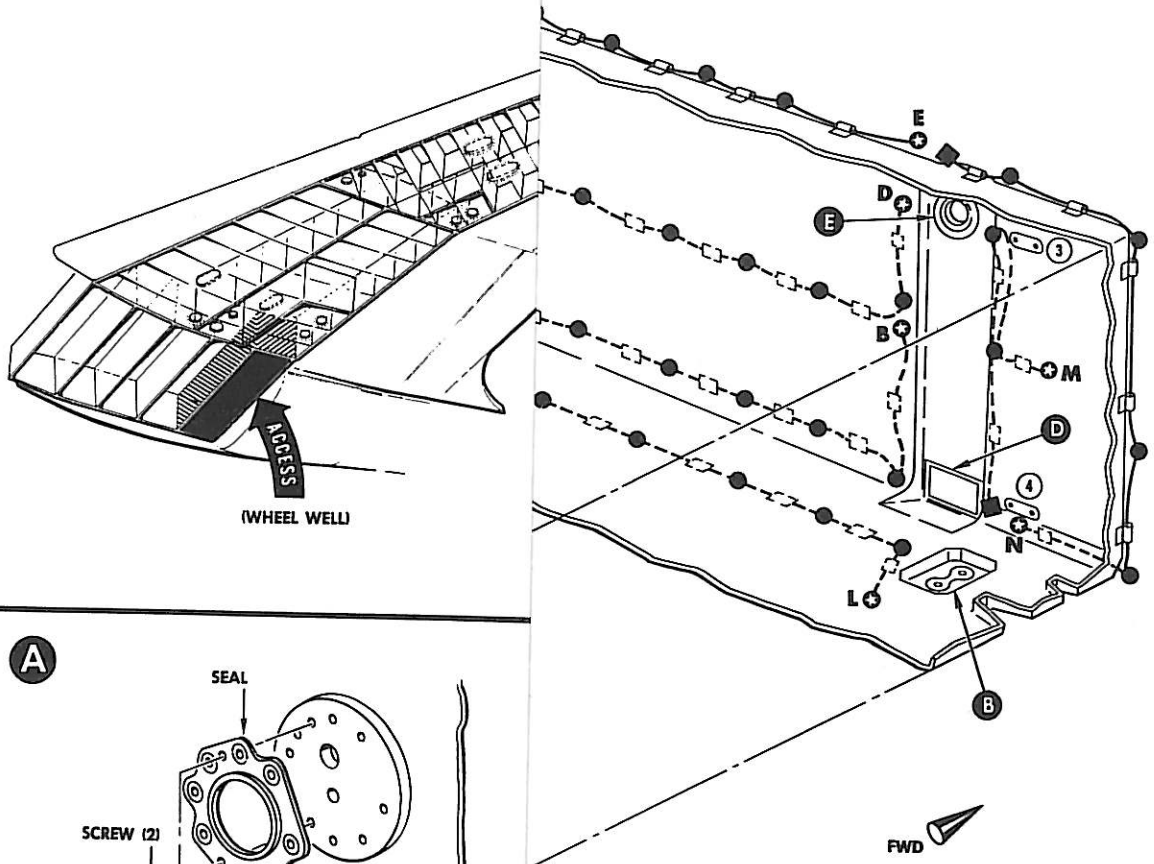
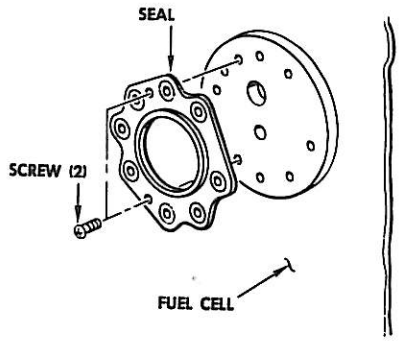
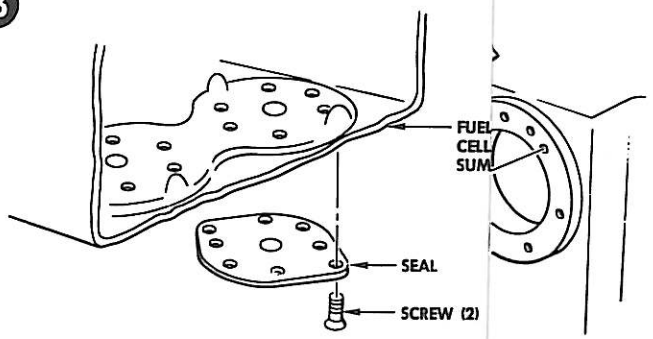


A



PUMP PRESSURE SWITCH FITTING (3)

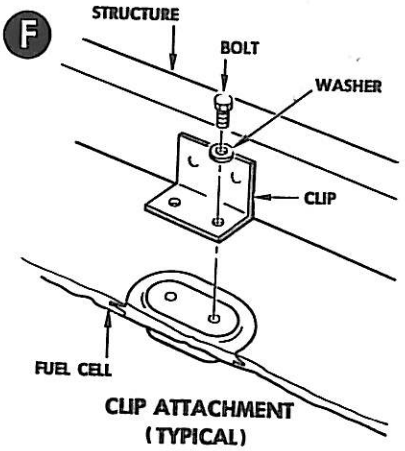
B



DRAIN FITTINGS
(2 PLACES)

ONNECT

F



CLIP ATTACHMENT
(TYPICAL)

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(7) Use three men to carry cell into cavity. Make sure rubber protectors are installed around access openings through which cell must pass during installation or removal. Do not force or drag cell through opening.

(8) Avoid stepping on creases or folds. Do not stand on unsupported fittings.

(9) Do not allow hot lights to rest against cell wall.

(10) Cells should be warmed to room temperature (above 65°F) before handling.

(11) Surfaces of cell opening fittings are critical sealing surfaces. Scratches or warpage in these surfaces will cause a leak. Do not use a screwdriver or other sharp object to pry the fittings loose during removal, or to pry off access doors; this can damage the sealing surface.

C. Equipment Required.

(1) Heavy cardboard or other suitable protective covering for cell floors.

(2) Nylon lacing cord, Specification MIL-C-5040, Type III.

(3) Masking tape.

D. Prepare for Cell Replacement.

(1) Defuel center tank; refer to Chapter 12, SERVICING.

(2) Inert tank; refer to 28-1-0, Servicing.

WARNING: OBSERVE ALL TANK ENTRANCE PRECAUTIONS OUTLINED IN 28-1-0. USE ONLY EXPLOSION-PROOF SHIELDED LIGHTS IN AND AROUND FUEL CELLS.

(3) Prepare a smooth, clean area upon which to lay out cell for visual check after removal.

(4) Place protective covering on floor of each cell that will be entered.

NOTE: To avoid unnecessary traffic through cells, remove cells in consecutive order starting with aft cell, and install in consecutive order starting with forward cell. If all cells are not being replaced, it is permissible to go through cell(s) that are to remain in airplane if the cell floor is adequately protected.

(5) Check condition of all cords. If any cords need replacing, determine length by measuring from starting point fitting to tie-off fitting, then add 24 inches to allow for tying the cord.

(6) Point lacing cord ends, to facilitate threading through lacing tabs and eye-bolts, as follows:

(a) Heat cord end over a small flame until cord is pliable.

(b) Using a rag over fingers, form cord end to a medium point. Wipe off any irregular particles.

WARNING: LIQUID NYLON WILL CAUSE SEVERE BURNS TO SKIN.

E. Remove Fuel Cell No. 1; see Figure 202.

(1) Remove cell No. 1 fuel system components; refer to applicable section detailing procedure for each component.

CAUTION: PLACE BOLTS AND FASTENERS IN A CONTAINER TO PREVENT LOSING THEM INSIDE CELL. AVOID DROPPING TOOLS OR HEAVY PARTS IN CELL.

(2) Unfasten all harness clips on floor of cell. Pull harness through fuel interconnects and into cell No. 2.

(3) Identify and remove tubing from cell.

(4) Remove bolts attaching aft access door fittings; see Figure 203.

(5) Remove bolts attaching fuel and vent interconnect fittings on auxiliary spar No. 4; see Figure 203.

(6) Remove debris from inside of cell.

(7) Visually examine interior of cell for possible defects. Mark all suspected areas for more complete check after cell is removed.

(8) Untie cords Z and AB at tie-off points near access door.

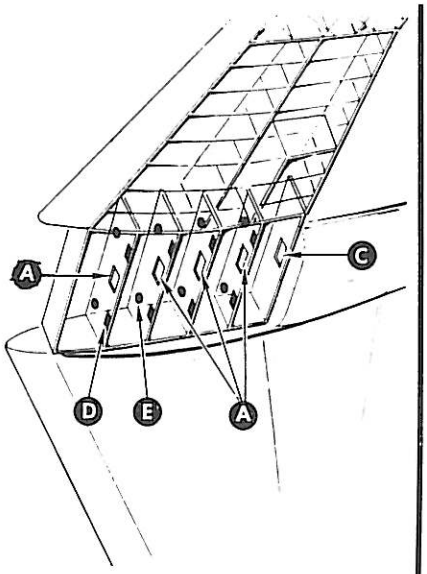
(9) Untie and unlace cord U along bottom of cell.

(10) Push forward on aft wall of cell and unlace cords W and V progressively towards right end of cell until cavity area outside of cell can be entered.

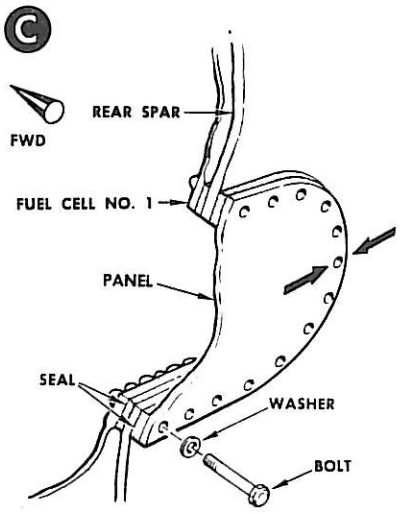
(11) Proceed with unlacing of remaining cords at top, bottom, and ends of cell, pushing cell forward as unlacing progresses. Coil and hang cords at their starting point fittings as each one is completely unlaced.

(12) Remove screws from eight clips attaching top of cell to structure.

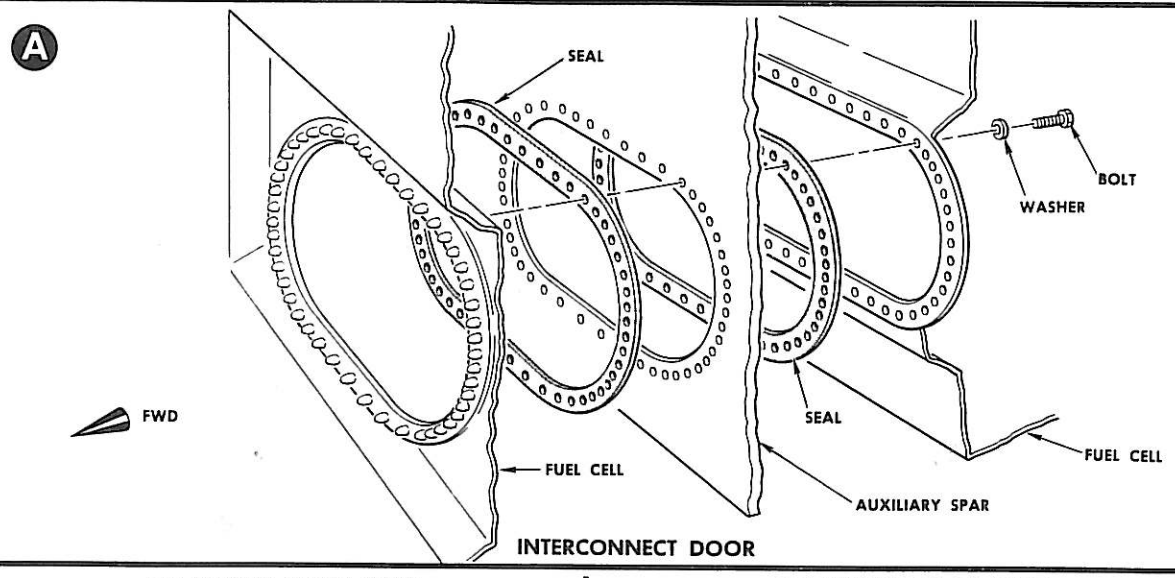
(13) Continue unlacing and pushing cell forward until cell is draped over auxiliary spar No. 4.



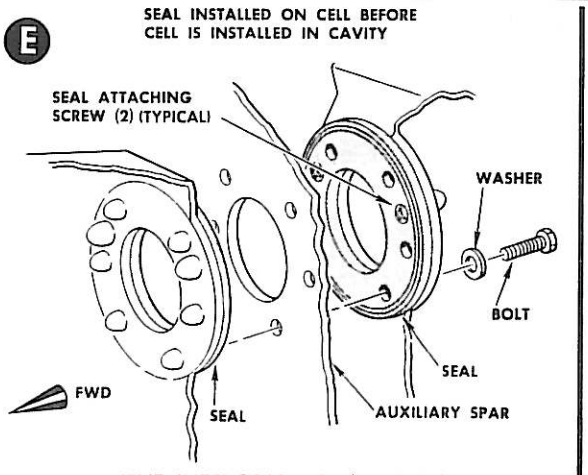
CENTER SECTION TANK



AFT ACCESS DOOR



INTERCONNECT DOOR



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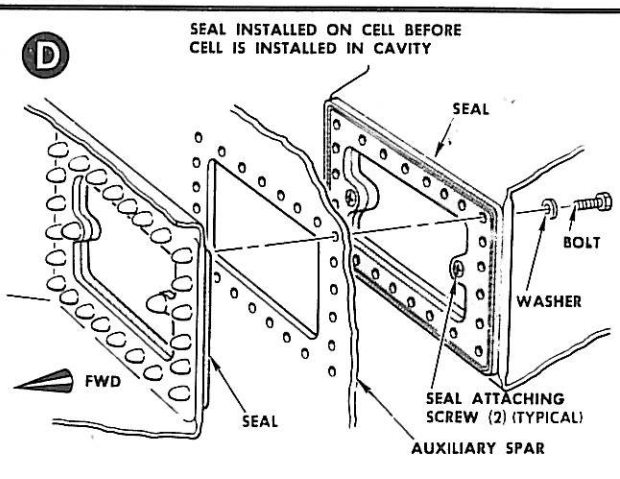
VENT INTERCONNECT (TYPICAL)



FUEL INTERCONNECT (TYPICAL)

(14) Make sure all cords at bottom and sides of cell are completely unlaced. Carefully smooth bottom of cell preparatory to folding it when remaining cords are unlaced.

(15) Unlace remaining cords, working from the top down.

(16) Fold and tie cell and remove from cavity. Use care to prevent cell from rubbing against structure during removal.

(17) Lay cell out and examine all of exterior. Mark areas of abrasions, then locate and repair the cavity areas causing the abrasions.

(18) If cell is to be stored after removal, the inner surface must be preserved. Do this by coating with clean, non-additive, SAE 10-20 engine oil.

F. Install Fuel Cell No. 1; see Figure 202.

(1) Visually check cavity for cuts, slivers, rough spots, etc., and cover with tape or repair as necessary.

(2) Make sure that all lacing cords are coiled and hanging at their respective starting point fittings. Secure one end of each cord firmly to its fitting; see Figure 201.

(3) Clean surfaces and install seals on cell at all opening fittings; see Figure 203. Cover seals with tape and cardboard.

(4) Fold, tie, and place fuel cell No. 1 in cavity No. 1.

(5) Remove cotton web straps and unfold cell; remove seal protective covering.

(6) Lace horizontal portions of cords A and B and do not tie.

(7) Lace horizontal portions of cords C and D and do not tie.

(8) Lace and permanently tie cord E.

(9) Complete lacing of cords C and A and tie permanently.

(10) Lace and permanently tie cords F and G; fasten fittings 1 and 2 on forward wall of cell.

(11) Lace cords H and J but do not tie.

(12) Lace and permanetly tie cord K; fasten clips 1 and 2.

(13) Lace cord L approximately half way, then fasten clips 3 and 4.

(14) Complete lacing of cords B and D and tie permanently.

(15) Lace and permanently tie cords M and N; fasten fittings 3 and 4 on forward wall of cell.

(16) Lace and permanently tie cords P, Q, R, and S, in that order.

(17) Complete lacing of cord L and tie permanently.

(18) Lace and permanently tie cord T.

(19) Lace cord U to lower left corner of cell, then fasten clips 5 and 6.

(20) Lace cords V and W approximately half way, then fasten fittings 5 and 6.

(21) Complete lacing of cords V and W and tie permanently; fasten fittings 7 and 8.

(22) Permanently tie cords H and J.

(23) Lace and permanently tie cords X and Y.

(24) Lace and permanently tie cord Z; fasten clip 8.

(25) Lace and permanently tie cord AA; fasten clip 7.

(26) Lace and permanently tie cord AB.

(27) Complete lacing of cord U and tie permanently; fasten fittings 9 and 10.

(28) Install all bolts around intercell access door, fuel interconnects, and vent interconnects on auxiliary spar No. 4; see Figure 203.

CAUTION: MAKE SURE THAT SCREWS TO BE INSTALLED IN ALL FUEL CELL FITTING INSERTS ARE OF CORRECT LENGTH. SCREWS THAT ARE TOO SHORT OR TOO LONG WILL DAMAGE THE INSERTS.

(29) Install cell No. 1 fuel system components; refer to applicable section detailing procedure for each component.

(30) Install engine fuel supply line between left and right walls of cell; refer to 28-0 for Wiggins flex coupling installation procedure.

(31) Install lines connecting left and right boost/jettison pumps to engine fuel supply line, across cell; refer to 28-0 for flex coupling installation.

(32) Install control lines connecting refuel shutoff valve to right wall fitting of cell.

(33) Install lines from refueling selector valve to left and right walls of cell; refer to 28-2-6 and 28-2-7.

(34) Install line connecting vent valve to fitting on cell wall; refer to 28-0 for flex coupling installation procedure.

(35) Leak test cell installation; refer to Adjustment/Test Center Tank Fuel Cells - Leak Test (Cells Installed in Airplane).

NOTE: If cell is to remain empty for ten days or more, the inner surface must be preserved. Do this by coating the surface with clean, non-additive, SAE 10-20 engine oil.

G. Remove Fuel Cell No. 2, 3, 4, or 5.

(1) Remove any fuel system components in cell; refer to applicable section detailing procedure for each component.

(2) Unlace cell; start at cell entrance door and work progressively forward, following the same pattern outlined under paragraph E. for cell No. 1.

(3) Fold and tie cell and remove from cavity. Use care to prevent cell from rubbing against structure during removal.

(4) Lay cell out and examine all of exterior. Mark areas of abrasions, then locate and repair the cavity areas causing the abrasions.

(5) If cell is to be stored after removal, the inner surface must be preserved. Do this by coating with clean, non-additive, SAE 10-20 engine oil.

H. Install Fuel Cell No. 2, 3, 4, or 5.

(1) Visually check cell cavity for cuts, slivers, rough spots, etc., and repair or smooth as necessary.

(2) Make sure that all lacing cords are coiled and hanging at their respective starting point fittings; see Figure 201.

(3) Clean surfaces and install seals on cell at all opening fittings; see Figure 203.

(4) Fold, Tie, and place fuel cell in cavity.

(5) Remove cotton web straps and unfold fuel cell; remove seal protective covering.

(6) Lace cell in cavity by following the same pattern outlined under paragraph F. for cell No. 1. Start at the forward wall and work progressively aft, finishing at the cell entrance door.

(7) Install all bolts around forward and aft cell interconnects, fuel interconnects, and vent interconnects; refer to item 2.

CAUTION: MAKE SURE THAT SCREWS TO BE INSTALLED IN ALL FUEL CELL FITTING INSERTS ARE OF CORRECT LENGTH. SCREWS THAT ARE TOO SHORT OR TOO LONG WILL DAMAGE THE INSERTS.

(8) Leak test cell installation; refer to adjustment/Test Center Tank Fuel Cells - Leak Test (Cells Installed in Airplane).

(9) Clean cell thoroughly and install access panel at rear spar.

(10) If no other maintenance is to be performed in center tank area, refuel tank; refer to Chapter 12, SERVICING.

NOTE: If cell is to remain in airplane without fuel for ten days or more, the inner surface must be preserved. Do this by coating the surface with clean, non-additive, SAE 10-20 engine oil.

2. Removal/Installation Intercell Connect Fittings and Seals (see Figure 203)

A. Equipment Required - None.

B. Disassemble fittings and remove Seals.

NOTE: Two cells are bolted together at each auxiliary spar through the access, fuel interconnect, and vent interconnect fittings. When removing a cell, and adjacent cell is not to be removed, the seals for the adjacent cell (on opposite side of auxiliary spar), must be held to prevent them from dropping between cell and spar. The seals for the adjacent cell should be taped to their respective cell fitting until the removed cell is reinstalled.

(1) Remove bolts around fuel interconnect fittings; retain seals for installation if serviceable. Cover sealing surfaces of cell fittings with tape.

(2) Remove bolts around access openings and vent interconnect fittings. Before removing last bolt from a fitting, hold seal to prevent it from dropping (there are seals on both sides of auxiliary spars).

(3) Retain seals for installation if servicable. Cover sealing surfaces of fittings with tape. If adjacent cell forward is not to be removed, seals for the cell should be taped to their respective fittings.

C. Assemble Fittings and Install Seals.

(1) Make sure seals are clean and surfaces of fittings to be assembled are clean and free of scratches.

(2) Position seal(s) at vent interconnect fittings and install bolts.

(3) Position seal(s) and install bolts at cell interconnects and fuel interconnect openings, in that order.

CAUTION: MAKE SURE THAT SCREWS TO BE INSTALLED IN ALL FUEL CELL FITTING INSERTS ARE OF CORRECT LENGTH. SCREWS THAT ARE TOO SHORT OR TOO LONG WILL DAMAGE THE INSERTS.

3. Adjustment/Test Center Tank Fuel Cells - Leak Test (Cells Installed in Airplane)

A. Equipment Required.

(1) Open end "U" manometer, - water type.

(2) Source of air pressure capable of delivering 0.2 psi dry filtered air, and equipped with a regulator.

(3) G.E. leak detector, type H-1.

(4) Freon 12 gas.

(5) Three fittings for connecting hoses from manometer, air pressure source, and Freon source to the 1/4-inch threaded drain holes of the center section cavity.

NOTE: If these fittings should be unavailable, substitution can be accomplished by equipping the hoses from manometer, air pressure source, and Freon source with a plastic or rubber tube that will enter the 1/4-inch threaded drain holes with a snug fit.

B. Prepare to Leak Test Fuel Cells.

(1) Seal with tape the center section cavity vent hole (hole is flush with wing lower surface, just outboard of fuselage "canoe", right side).

(2) Remove screws from the three forward center section cavity vent drain holes. These are located on wing undersurface, just outboard of the fuselage "canoe", left side. Install fittings noted in item A.(5) in holes from which screws were removed.

C. Leak Test Cells.

(1) Connect manometer hose to fitting on aft drain hole.

(2) Connect air pressure source to fitting just forward of fitting to which manometer is connected.

(3) Connect Freon source to fitting on forward cavity drain hole.

(4) Turn on air source and pressurize center section cavity area to 0.2 psi (5.5 inches of water measured in the open "U" manometer).

(5) Turn on Freon source for five seconds. Check as follows to determine if a measurable quantity of Freon has been introduced into cavity:

(a) Set leak detector at medium sensitivity.

(b) Loosen screw on farthest aft cavity drain hole just enough to cause air leakage.

(c) Use leak detector to check if air leaking from drain hole contains measurable Freon. If detector shows no Freon indication, tighten drain hole screw, repeat Freon injection and detection procedure until Freon indication is obtained with leak detector.

(6) Check cavity pressure on manometer and repressurize if pressure has fallen below 0.2 psi.

(7) Enter fuel cell and set leak detector at maximum sensitivity.

CAUTION: OBSERVE ALL TANK ENTRANCE PRECAUTIONS; REFER TO 28-1-0.

(8) Using leak detector, check all areas of cell for evidence of leakage. Check all cell fitting openings very carefully; most leaks are associated with fitting attachments. Mark all points found to be leaking.

(9) Set leak detector at medium sensitivity and recheck and remark leaking points.

(10) Repeat leak check procedure for each cell.

(11) Disassemble fittings found to be leaking and carefully examine sealing surfaces for scratches. Burnish any scratches in sealing surfaces and reassembly fitting with new seals.

(12) Repeat leak test and repair procedure until all leaks have been corrected.

(13) Reduce cavity pressure to zero and remove all test equipment. Replace cavity drain hole screws.

NOTE: If tests indicate no fuel cell leakage, and fuel can be drained from the center section cavity drain valve or from the drain screw holes, it is possible that fuel from wing tank No. 2 or 3 is leaking into the center section cavity through left or right bulkhead No. 1. Refer to Chapter 57, WINGS, for integral fuel tank leak test procedure.

(12) Repeat leak test and repair procedure until all leaks have been corrected.

(13) Reduce cavity pressure to zero and remove all test equipment. Replace cavity drain hole screws.

NOTE: If tests indicate no fuel cell leakage, and fuel can be drained from the center section cavity drain valve or from the drain screw holes, it is possible that fuel from wing tank No. 2 or 3 is leaking into the center section cavity through left or right bulkhead No. 1. Refer to Chapter 57, WINGS, for integral fuel tank leak test procedure.

OUTBOARD ASB DIAPHRAGM - MAINTENANCE PRACTICES

1. Removal/Installation Outboard ASB Diaphragm (see Figure 201)

   A. Equipment Required. Hole saws of the following diameters: 0.568-inch; 1.50, 2.00, and 3.00 inches.

   B. Materials Required (for -3 or -4 Diaphragm Replacement Only).

      (1) Toluene, Federal Specification T-T-548 or equivalent.

      (2) Methyl ethyl ketone, Federal Specification TT-M-261 or equivalent.

      (3) Primer No. 90311, Firestone Tire and Rubber Co., Los Angeles, Calif.

      (4) Top coat No. RP12708, Firestone Tire and Rubber Co., Los Angeles, California.

   C. Prepare for Diaphragm Replacement.

      (1) Defuel applicable outboard ASB and wing outboard tank; refer to Chapter 12, SERVICING.

      (2) Inert outboard ASB and tank; refer to 28-1-0.

   D. Remove Diaphragm.

      (1) Disconnect fuel, vent, jettison, and refuel sensing lines at top side of diaphragm inside ASB. Refer to 28-0 for flex coupling assembly procedure.

      (2) Remove nut from each of the four refuel sensing line fittings at top side of diaphragm.

      (3) Remove elbow fittings for fuel, vent, and jettison lines from top side of diaphragm. (Retain seals for installation, if serviceable.)

         NOTE: Each elbow fitting on lower side of diaphragm (inside of wing tank) is held in place with two screws installed from upper (ASB) side. Do not remove these screws unless removal of elbow fittings is desired.

      (4) Remove 67 screws attaching diaphragm to ASB floor and remove diaphragm. (Retain seal for installation, if serviceable.)

         NOTE: Check dash number of diaphragm before discarding; if -3 or -4, it will be necessary to drill holes in a replacement diaphragm of the same dash number to match the tubing elbow fittings. Drill the holes as outlined in paragraph E., before installing diaphragm. If the removed diaphragm is a -1 or -2, the replacement diaphragm of the same dash number

will have the holes predrilled and paragraph E. may be omitted.

E. Drill and Seal Holes in Diaphragm (Applicable for -3 or -4 Diaphragms; see note in step D.(4)).

(1) Remove refuel sensing, vent, and jettison line fittings from underside of wing upper surface at diaphragm location.

(2) Position undrilled diaphragm in ASB floor opening and temporarily install a few attachment screws around outer perimeter.

(3) Press diaphragm firmly against wing upper surface; through holes in wing skin, scribe all holes to be drilled in diaphragm.

(4) Remove diaphragm and replace fittings removed in step (1).

(5) Mark exact center of scribed circle, and drill pilot hole for hole saw. Use drill that is same size as hole saw pilot.

(6) Using hole saw, carefully cut out all scribed holes in diaphragm. Remove any burrs from hole edges.

(7) Clean inside diameter of drilled holes thoroughly with toluene and allow to dry a minimum of one hour before applying primer and top coat.

(8) Using a cotton swab, apply Firestone primer to entire inside diameter of drilled holes; avoid application of surplus on sealing surfaces of diaphragm. Allow to dry a minimum of 45 minutes.

(9) Apply Firestone top coat with a cottom swab to entire inside diameter of drilled holes; avoid application of surplus on sealing surfaces of diaphragm. If material is too thick to apply with a swab, dilute with methyl ethyl ketone.

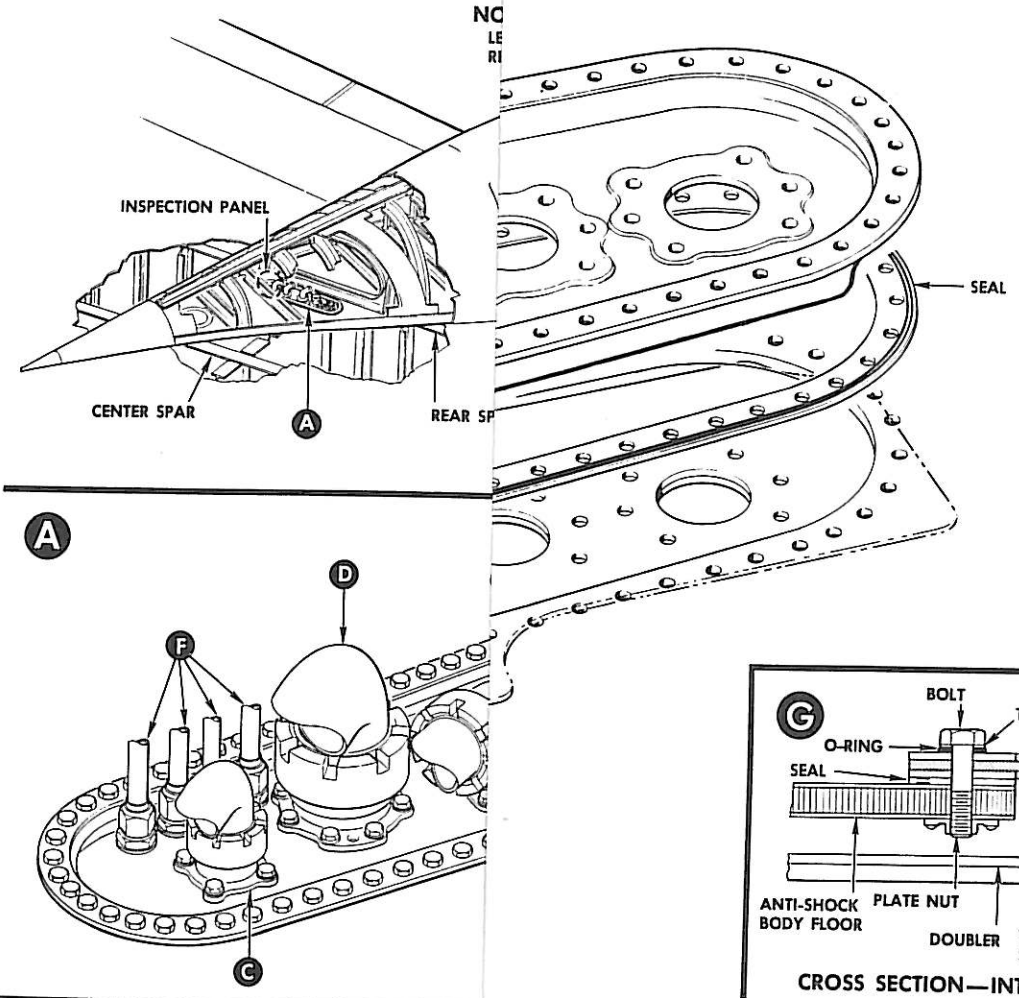
(10) Remove any surplus coating on sealing surfaces of diaphragm with methyl ethyl ketone. Allow coated drilled surfaces to dry a minimum of 24 hours before refueling tanks.

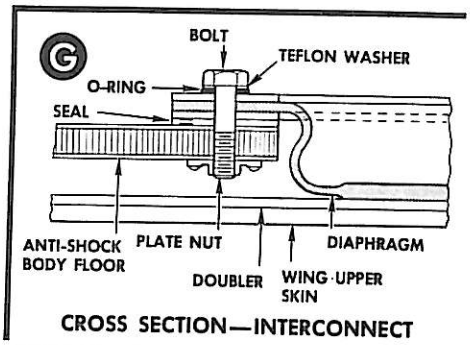
F. Install Diaphragm.

(1) Procure two quarter-inch bolts, approximately two inches long, with UNF thread; cut heads off the bolts.

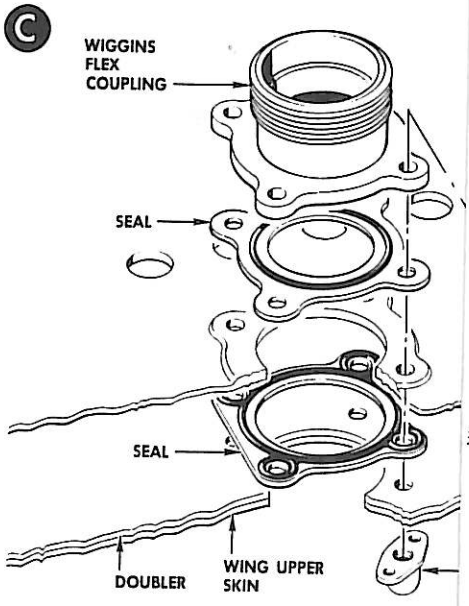
(2) Install the two headless bolts loosely at wing upper surface fuel line fitting location, to hold the fuel line fitting seal in alignment until the fuel line fitting is installed.

(3) Position fuel line fitting seal on wing upper surface (slipped over headless bolts).

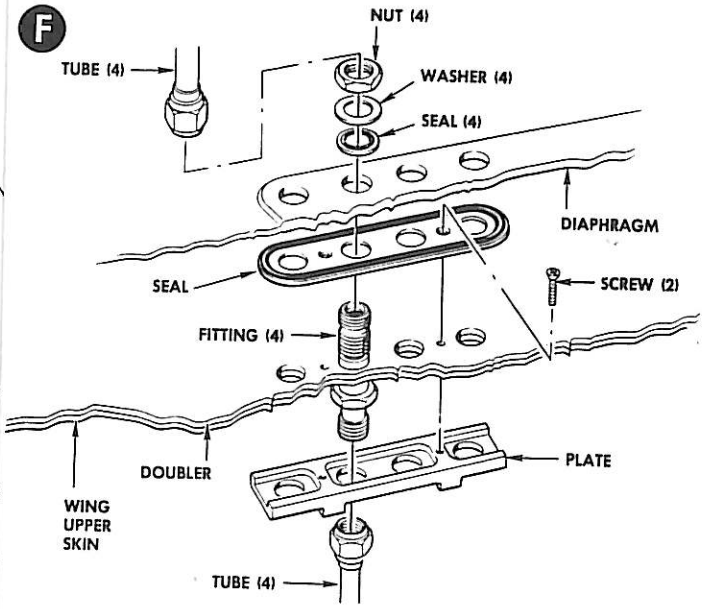




CROSS SECTION—INTERCONNECT



FUEL SUPPLY LINE FITTING



FUEL SENSING LINE FITTING—TYPICAL

30.02.28.073

Diaphragm Installation
Figure 201

(4) Position diaphragm and diaphragm seal in ASB floor opening with headless bolts protruding through corresponding diaphragm bolt holes. (Make sure mating surfaces of all parts are clean.)

(5) Install 67 screws attaching diaphragm to ASB floor.

(6) Position fuel line fitting with a seal between fitting and diaphragm. Install two attachment bolts, remove the two headless bolts, and install remaining two attachment bolts.

(7) Install three jettison line fittings and vent line fitting with a seal under each fitting.

(8) Install seal and nut at each of the four refuel sensing line fittings.

(9) Connect fuel line, jettison lines, vent line, and refuel sensing lines to their respective fittings.

(10) Clean ASB (and wing tank if entered); refer to 28-1-0.

(11) Refuel ASB and wing tank; refer to Chapter 12, SERVICING.

(12) Check diaphragm in the area between wing upper surface and ASB floor for leaks.

ASB TAIL CONE AND TRAP TANK - MAINTENANCE PRACTICES

1. Removal/Installation ASB Tail Cone

NOTE: Tail cone removal will give access to the rectangular door on the aft wall of the trap tank for access to components in the trap tank.

A. Equipment Required - None.

B. Remove Inboard ASB Tail Cone.

(1) Remove two circular access doors at top forward end of tail cone.

(2) Disconnect vent line at coupling.

(3) Support tail cone and remove seven hex head attaching screws.

(4) Remove tail cone and cap open lines.

C. Install Inboard ASB Tail Cone.

(1) Position tail cone and install seven hex head attaching screws.

(2) Connect vent line and install two access doors.

D. Remove Outboard ASB Tail Cone.

(1) Remove two circular access doors at top forward end of tail cone.

(2) Disconnect couplings of three jettison lines, vent line, and sensing line.

(3) Support tail cone and remove eight hex head attaching screws.

(4) Remove tail cone and cap all open lines.

E. Install Outboard ASB Tail Cone.

(1) Position tail cone and install eight hex head attaching screws.

(2) Connect jettison lines, vent line, and sensing line.

(3) Install access doors.

REFUEL-DEFUEL SYSTEM - DESCRIPTION AND OPERATION

1. General

The basic pressure refueling equipment consists of four refuel-defuel nozzle adapter fittings with integral fuel inlet check valves and refuel nozzle connections, five refuel shutoff valves, one in each main tank and one in the center section tank, and associated tubing. Two adapters on each wing are connected to a common tubing system to distribute fuel to the various tanks in the corresponding wing and to the center section tank. An internal drain check valve in the tubing system is closed by fuel pressure during refueling; when pressure is removed, the drain check valve opens, venting the tubing system through a normally open solenoid-operated shutoff valve and permitting fuel in the tubing system to be used by the engines. During defueling, which is accomplished by applying external suction to the adapters, the vent shutoff valve is closed to prevent loss, through the drain check valve, of negative pressure in the piping system. Each tank system is controlled by a primary and secondary stop-fuel solenoid valve, a repeater indicator and shutoff test switch, and a refuel pilot valve. The pressure refueling system and equipment is shown on Figures 1 and 2.

The fuel inlet check valve will not open unless the attaching nozzle is properly secured to the connector, thus preventing any fuel spillage. The primary and secondary valves in the refuel shutoff valve assembly open under pressure from the fueling flow produced by the ground equipment; the fuel flow pressure (50 psia, with a maximum of 60 psia) keeps the valves open until the desired amount of fuel has been taken aboard. At that time, control fuel pressure is admitted to the associated refuel pilot valve, which then causes the corresponding refuel shutoff valve to stop refueling flow. Refueling rate for each of the four adapters is between 200 and 300 gpm at 50 psia, and the four adapters may be used simultaneously.

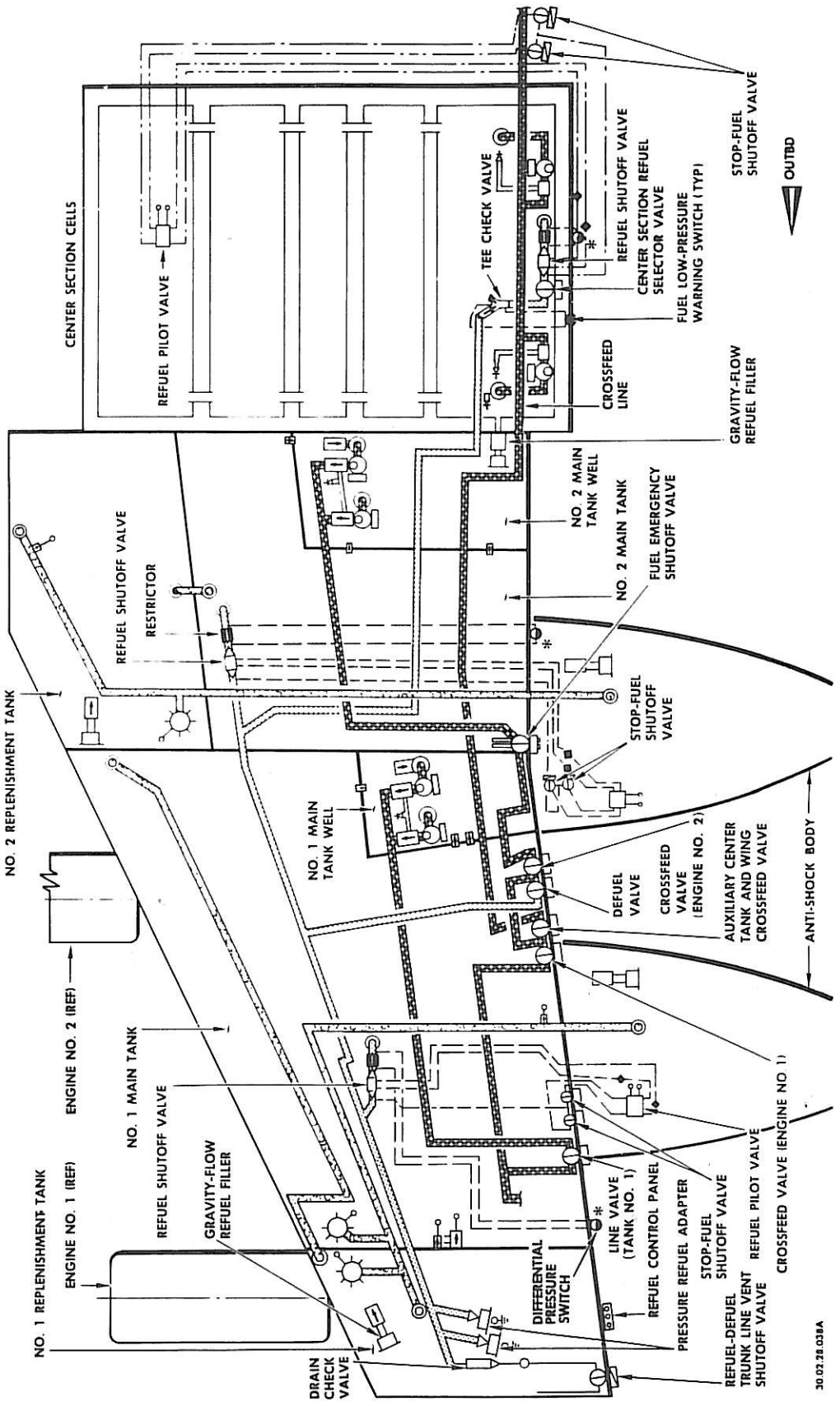
Alternate gravity-flow refueling is accomplished through the four service openings into the wing replenishment tanks, through the openings in the upper surface of the ASB's, and through the center section tank opening, which is located in the wing upper surface over the No. 2 main tank. The fillers are capable of receiving fuel from a two-inch diameter nozzle at the rate of 150 gpm. As the fuel for the wing tanks enters the replenishment tanks, the fuel level is equalized in the main tanks through check valves, bulkhead openings, and vent system tubing in the separating bulkheads. During gravity-flow refueling, the center section tank and the ASB tanks are refueled independently of the four main wing tank systems.

Defueling is controlled from the flight engineer's fuel control panel and is accomplished through any or all of the four refuel adapter fittings. An electrical schematic of the system is shown on Figure 3.

2. Refuel Pilot Valves

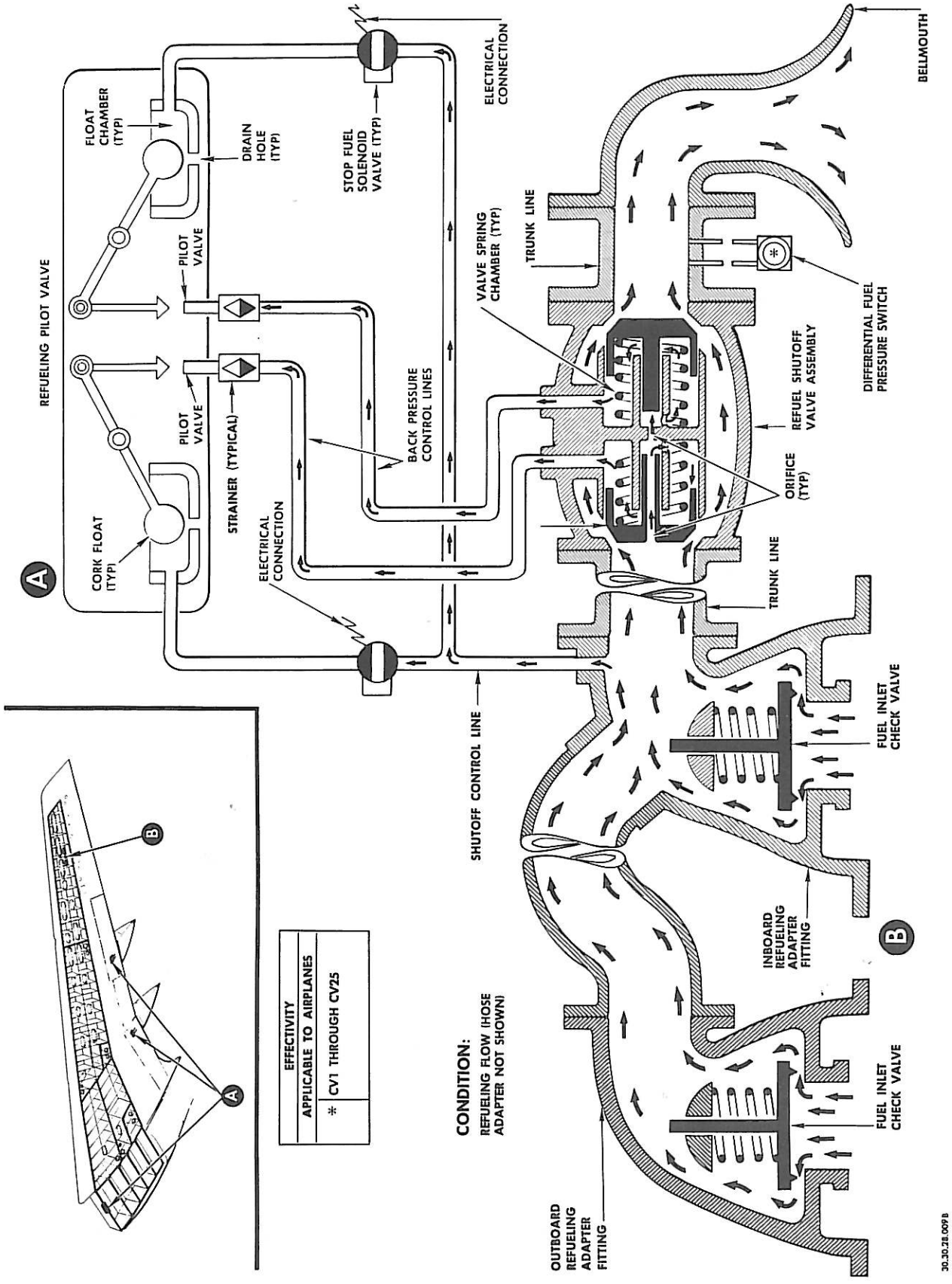
There is one refuel pilot valve in each ASB tank, and one in the forward cell of the center section tank. Each refuel pilot valve consists of two float chambers, two cork floats, two float-check poppet valves, and inlet

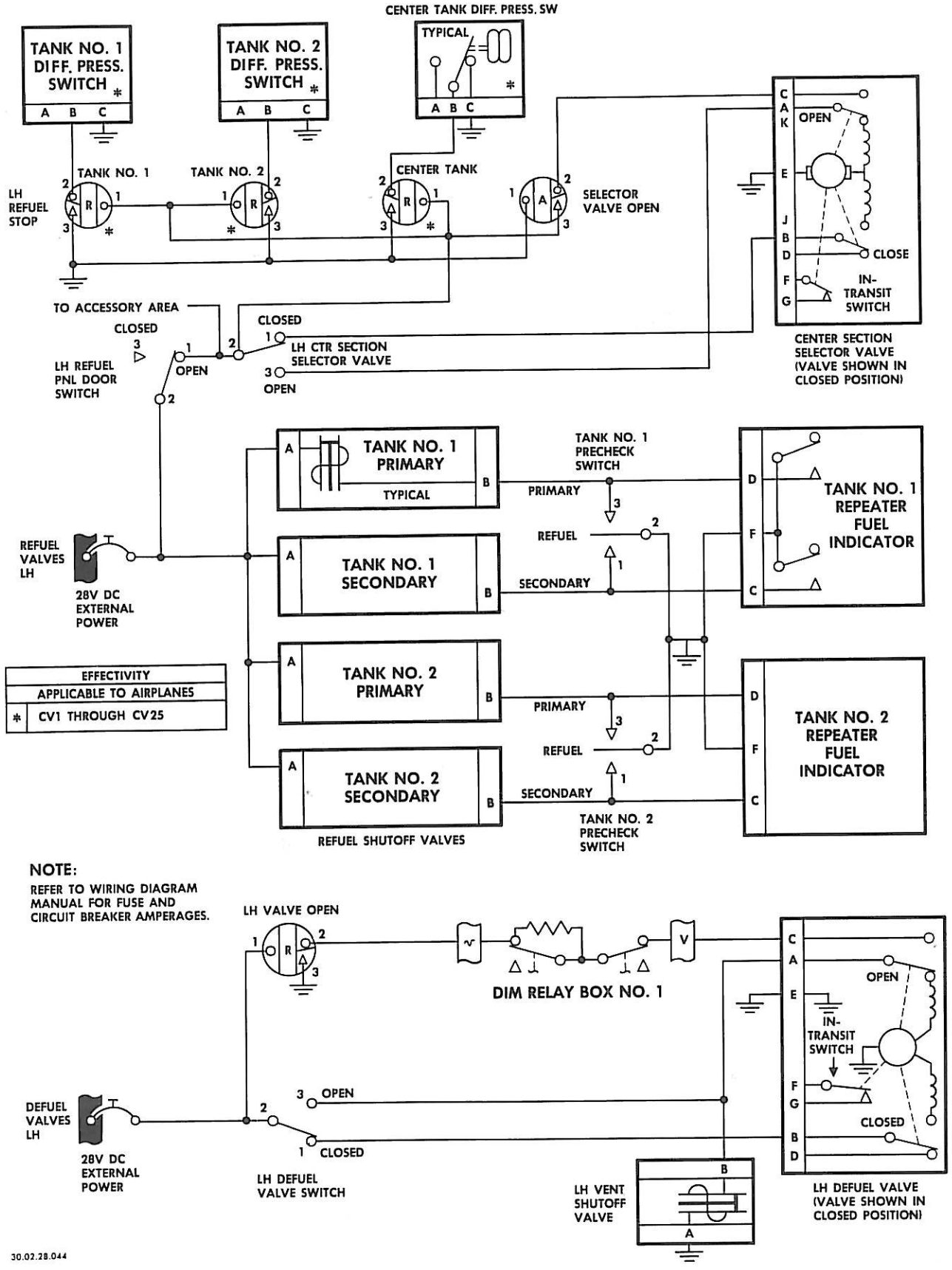
EFFECTIVITY
APPLICABLE TO AIRPLANES
* CV1 THROUGH CV25



NOTE:
LEFT WING SYSTEM SHOWN-
VIEW LOOKING DOWN

Refuel-Defuel System Schematic
Figure 1


REFUELING PILOT VALVE
FLOAT CHAMBER (TYP)
DRAIN HOLE (TYP)
STOP FUEL SOLENOID VALVE (TYP)
ELECTRICAL CONNECTION
BELLMOUTH
PILOT VALVE
VALVE SPRING CHAMBER (TYP)
TRUNK LINE
PILOT VALVE
STRAINER (TYPICAL)
BACK PRESSURE CONTROL LINES
REFUEL SHUTOFF VALVE ASSEMBLY
DIFFERENTIAL FUEL PRESSURE SWITCH
CORK FLOAT (TYP)
ELECTRICAL CONNECTION
ORIFICE (TYP)
TRUNK LINE
SHUTOFF CONTROL LINE
FUEL INLET CHECK VALVE
INBOARD REFUELING ADAPTER FITTING
FUEL INLET CHECK VALVE
OUTBOARD REFUELING ADAPTER FITTING
CONDITION:
REFUELING FLOW (HOSE ADAPTER NOT SHOWN)
EFFECTIVITY
APPLICABLE TO AIRPLANES
* CV1 THROUGH CV25
30.30.28.009 B


CENTER TANK DIFF. PRESS. SW
TYPICAL
TANK NO. 1 DIFF. PRESS. SWITCH *
TANK NO. 2 DIFF. PRESS. SWITCH *
A B C
TANK NO. 1
TANK NO. 2
CENTER TANK
LH REFUEL STOP
SELECTOR VALVE OPEN
TO ACCESSORY AREA
CLOSED
OPEN
LH REFUEL PNL DOOR SWITCH
LH CTR SECTION SELECTOR VALVE
CENTER SECTION SELECTOR VALVE (VALVE SHOWN IN CLOSED POSITION)
OPEN
CLOSE
IN-TRANSIT SWITCH
TANK NO. 1 PRIMARY
TANK NO. 1 SECONDARY
TANK NO. 2 PRIMARY
TANK NO. 2 SECONDARY
TYPICAL
TANK NO. 1 PRECHECK SWITCH
TANK NO. 2 PRECHECK SWITCH
PRIMARY
REFUEL
SECONDARY
TANK NO. 1 REPEATER FUEL INDICATOR
TANK NO. 2 REPEATER FUEL INDICATOR
REFUEL VALVES LH
28V DC EXTERNAL POWER
REFUEL SHUTOFF VALVES
EFFECTIVITY
APPLICABLE TO AIRPLANES
* CV1 THROUGH CV25
NOTE:
REFER TO WIRING DIAGRAM MANUAL FOR FUSE AND CIRCUIT BREAKER AMPERAGES.
LH VALVE OPEN
DIM RELAY BOX NO. 1
DEFUEL VALVES LH
28V DC EXTERNAL POWER
OPEN
CLOSED
LH DEFUEL VALVE SWITCH
LH VENT SHUTOFF VALVE
LH DEFUEL VALVE (VALVE SHOWN IN CLOSED POSITION)
IN-TRANSIT SWITCH
30.02.28.044

and outlet ports. A metal shield covers the open float chambers. The inlet ports, marked PT (primary test) and ST (secondary test), are connected by tubing to corresponding stop-fuel solenoid valves, which are in turn connected by tubing to pressure outlets in the refueling trunk lines, adjacent to and upstream from the refuel shutoff valves. Control line ports at the refuel pilot valve's float-check poppet valves, which are opened and closed by action of the primary and secondary floats, connect to the respective primary and secondary valve of the refuel shutoff valve. The refuel pilot valves, actuated by opening of the stop-fuel solenoid valves, close off fuel flow through the corresponding refuel shutoff valve spring chambers, causing the refuel shutoff valves to stop refueling flow. The refuel pilot valves are located immediately below the upper limit of tank fluid level. Thus, when the tank is filled to the correct expansion space, the float chambers fill, to stop refueling. A typical refuel pilot valve is shown on 28-2-1, Figure 201.

3. Refuel Shutoff Valves

The refuel shutoff valves are located in the refueling trunk lines in each main tank and in the center section tank. During refueling, pressurized fuel flows through the refuel shutoff valve's primary and secondary valve spring chambers, and through tubing to a corresponding refuel pilot valve. Closure of the refuel pilot valve causes backpressure buildup in the refuel shutoff valve spring chambers; the backpressure force combines with the spring force to close the refuel shutoff valve. A valve is shown on 28-2-2, Figure 201.

4. Stop-Fuel Solenoid Valves

There are 10 stop-fuel solenoid gate valves, two for each refuel pilot valve. The valves for the outboard tank refuel system are located on the rear spars below the centerline of the outboard ASB. The valves for the inboard tank refuel systems are located in the forward fuel-tight bulkheads of the inboard ASB. The valves for the center section refuel system are located on the rear spar, outboard of wing bulkhead 1, right-hand. When actuated electrically, the valve gate opens and allows pressurized control fuel to flow to the refuel pilot valve floats. One of the valves for each refuel pilot valve is designated as a primary stop-fuel solenoid valve, the other as a secondary stop-fuel solenoid valve. The valves open automatically when contacts in the preset repeater gages close; the valves can be opened for prechecking, or emergency, by use of switches on the corresponding refuel control panel. The stop-fuel solenoid valves are shown on 28-2-3, Figure 201.

5. Defuel Valves

One defuel valve, with a thermal relief, is mounted on the rear spar within each outboard main tank. The defuel valves are operated by 28-volt dc power from the emergency bus, and in case of an airplane electrical malfunction, the airplane emergency battery dc power can be used. Control of the valves is through guarded switches on the flight engineer's fuel control panel; a red light on the panel illuminates when the defuel valve is open. The respective crossfeed and line valves for any tank that is to be defueled

must be open. A defuel valve, one for each wing, is moved to the open position when preparing to defuel either or both tanks of the corresponding wing; or if desired, the defuel valve in the opposite wing may be used by opening the center-tank-wing crossfeed valves and the required crossfeed and line valves. A defuel valve is shown on 28-2-4, Figures 201 and 202.

6. Refuel Control Line Strainers

There are ten line-mounted strainers in the refuel-defuel system, one in each of the two lines between a refuel pilot valve and a refuel shutoff valve. The strainers for the outboard ASB refuel pilot valves are located in the ASB tanks, adjacent to the refuel pilot valves; the strainers for the inboard ASB refuel pilot valves are outside the ASB tanks, in the wing trailing edges; and the strainers for the center section tank refuel pilot valve are in cell No. 1, adjacent to the refuel shutoff valve. The strainers have replaceable screens.

7. Center Tank Refueling Selector Valve

The center tank refueling selector valve is installed in the center tank refueling trunk line, upstream from the refuel shutoff valve. This valve, when closed, allows refueling of the wing tanks without refueling the center tank (wing and center tanks are refueled from the same refueling adapter fitting). With the valve open, wing and center tanks are refueled simultaneously. The refueling selector valve is shown on 28-2-6, Figure 201.

8. Differential Fuel Pressure Switches

(Applicable to airplanes CV1 through CV25.) There are five differential fuel pressure switches in the refuel-defuel system, one on the rear spar in each wing tank and one in the center section tank. If a refuel shutoff valve fails to shut off the flow of fuel when fueling is complete, the differential fuel pressure switch is actuated by increased pressure differential across a restrictor mounted downstream from the refuel shutoff valve. A light on the refuel control panel is lighted by actuation of the differential pressure switch to indicate the malfunction.

REFUEL-DEFUEL SYSTEM - TROUBLE SHOOTING

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
1. REFUELING FLOW WILL NOT STOP AT AMOUNT FOR WHICH PRESET CONTROL KNOB SET - PILOT VALVE PRECHECK SWITCH IN 'REFUEL' POSITION (FLOW STOPS WITH SWITCH IN 'PRECHECK PRIMARY' OR 'PRECHECK SECONDARY'	
A. Defective wiring between COM terminal of precheck switch for tank being refueled and corresponding repeater indicator.	Check for continuity through noted wiring. If no continuity, repair or replace wiring.
B. Defective repeater indicator.	Replace repeater indicator.
2. REFUELING FLOW WILL NOT STOP WITH PILOT VALVE PRECHECK SWITCH IN 'PRECHECK PRIMARY' - (STOPS WITH SWITCH IN 'PRECHECK SECONDARY' OR 'REFUEL')	
NOTE: Applicable also if 'SECONDARY' substituted for 'PRIMARY' and 'PRIMARY' substituted for 'SECONDARY'	
A. Defective precheck switch.	Check for continuity through switch, with switch in 'PRECHECK PRIMARY' position. If no continuity, replace switch.
B. Defective wiring between switch and stop-fuel solenoid.	Check for continuity through wiring. If no continuity, repair or replace wiring.
C. Defective stop-fuel solenoid	Check for continuity through solenoid. If no continuity, replace valve.
D. Broken or plugged control line between stop-fuel solenoid valve and tee to other stop-fuel solenoid valve.	Check for control line condition. Replace or clear line, as required.
E. Defective float or pilot valve in refuel pilot valve.	Check refuel pilot valve for condition. If defective, replace refuel pilot valve.
F. Broken or disconnected control line between refuel pilot valve and refuel shut-off valve.	Check for broken or disconnected control line. Replace or connect, as required.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
3. REFUELING FLOW FOR ONE TANK WILL NOT STOP WITH PRECHECK SWITCH IN ANY OF ITS THREE POSITIONS. (PRESET KNOB ON REPEATER INDICATOR SET AT OR BELOW EXISTING FUEL LEVEL)	
A. No power on 28-volt dc external power bus.	Refer to Chapter 24, ELECTRICAL POWER for source of trouble.
B. Defective circuit breaker.	Check for presence of power through circuit breaker. If no power, replace circuit breaker.
C. Broken, disconnected, or plugged control line between pressure refuel adapter and tee to both stop-refuel solenoid valves.	Check for condition of control line between noted points. Replace, connect, or clear line as required.
D. Refueling truck pressure too high (above 60 psig).	Check truck discharge pressure.
E. Defective refuel shutoff valve.	Replace refuel shutoff valve.
4. REFUELING FLOW STOPS BEFORE AMOUNT FOR WHICH PRESET CONTROL KNOB SET	
A. Internal short in repeater indicator.	Disconnect electrical plug from repeater indicator. Check for continuity between pins F and C and between pins F and D of receptacle on repeater indicator. If continuity exists, indicating short, replace repeater indicator.
B. Stop-fuel solenoid valve stuck in open position.	Hold hand lightly around solenoid valve. If valve cannot be felt to actuate when precheck switch is placed in corresponding test position, replace stop-fuel solenoid valve.
C. Clogged strainer in line between refuel shutoff valve and refuel pilot valve.	Remove strainer and disassemble. Clean, if serviceable, reassemble and install strainer.
D. Refuel pilot valve stuck in closed position.	Remove refuel pilot valve and check for sticking. Replace pilot valve.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
5. PRESSURE REFUEL ADAPTER CHECK VALVE LEAKS	
A. Foreign material under seat of valve.	Connect refueling hose nozzle to lift seat of valve, and partially defuel tank to attempt to dislodge any foreign material. Disconnect nozzle and check for leakage.
B. Defective valve.	If valve still leaks after performing item A., replace valve.
6. RH AND LH DEFUEL VALVE WILL NOT OPEN OR CLOSE	
A. Now power on 28-volt dc essential bus.	Refer to Chapter 24, ELECTRICAL POWER for source of trouble.
7. ONE DEFUEL VALVE WILL NOT OPEN OR CLOSE (RED 'VALVE OPEN' LIGHT DOES NOT ILLUMINATE ON 'PRESS-TO-TEST')	
A. Defective circuit breaker.	Check for presence of power through circuit breaker. If no power, replace circuit breaker.
B. Defective wiring between circuit breaker and splice point to light and valve switch.	Check for continuity through noted wiring. If no continuity, repair or replace wiring.
8. ONE DEFUEL VALVE WILL NOT OPEN OR CLOSE (RED 'VALVE OPEN' LIGHT ILLUMINATES ON 'PRESS-TO-TEST')	
A. Loose electrical plug at valve.	Check for loose plug at valve. If plug is loose, install correctly.
B. Defective wiring between switch and splice point for light.	Check for continuity through noted wiring. If no continuity, repair or replace wiring.
C. Defective valve.	Replace valve motor and gear train.
9. ONE DEFUEL VALVE WILL NOT OPEN (RED LIGHT ILLUMINATES ON 'PRESS-TO-TEST')	
A. Defective switch.	Check for continuity through control switch, with switch in OPEN position. If no continuity, replace switch.
B. Defective wiring between switch and valve.	Check for continuity through noted wiring. If no continuity, repair or replace wiring.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
9. ONE DEFUEL VALVE WILL NOT OPEN (RED LIGHT ILLUMINATES ON 'PRESS-TO-TEST')	
C. Defective valve.	Replace valve motor and gear train.
10. ONE DEFUEL VALVE WILL NOT CLOSE (RED LIGHT ILLUMINATES ON 'PRESS-TO-TEST')	
A. Refer to 9.A. through C. and substitute CLOSED for OPEN.	
11. RED 'VALVE OPEN' LIGHT FOR ONE DEFUEL VALVE DOES NOT ILLUMINATE WHEN VALVE IS OPEN (ILLUMINATES ON 'PRESS-TO-TEST')	
A. Defective dimming relay.	Check for continuity through dimming relay. Refer to Chapter 31, INSTRUMENTS for trouble.
B. Defective wiring between light socket and dimming relay; dimming relay and valve.	Check for continuity through noted wiring. If no continuity, repair or replace wiring.
C. Defective switch in valve.	Replace valve motor and gear train.
12. RED 'VALVE OPEN' LIGHT FOR ONE DEFUEL VALVE DOES NOT EXTINGUISH WHEN VALVE IS CLOSED.	
A. Wiring shorted to ground between light socket and dimming relay, or between dimming relay and valve.	Disconnect plug from relay. If light remains illuminated, short is between relay and switch. If light extinguishes, short is between relay and valve.
13. CENTER TANK REFUELING SELECTOR VALVE WILL NOT OPEN OR CLOSE RED 'VALVE OPEN' LIGHT DOES NOT ILLUMINATE ON 'PRESS-TO-TEST'	
A. Defective circuit breaker.	Check for presence of power through circuit breaker. If no power, replace circuit breaker.
B. Defective wiring between circuit breaker and refuel panel door switch.	Check for continuity through noted wiring. If no continuity, repair or replace wiring.
C. Defective refuel panel door switch.	Check for continuity through switch with door in open position. If no continuity, replace switch.
14. CENTER TANK REFUELING SELECTOR VALVE WILL NOT OPEN OR CLOSE (RED 'VALVE OPEN' LIGHT ILLUMINATES ON 'PRESS-TO-TEST')	
A. Loose electrical plug at valve.	Check for loose plug at valve. If plug is loose, install correctly.

	POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
14.	CENTER TANK REFUELING SELECTOR VALVE WILL NOT OPEN OR CLOSE (RED 'VALVE OPEN' LIGHT ILLUMINATES ON 'PRESS-TO-TEST') (CONT)	
B.	Defective valve.	Replace valve.
C.	Defective control switch.	Check for continuity through switch. If no continuity, replace switch.
D.	Defective wiring between switch and valve.	Check for continuity through noted wiring. If no continuity, repair or replace wiring.
15.	RED 'VALVE OPEN' LIGHT DOES NOT ILLUMINATE WHEN VALVE IS OPEN (ILLUMINATES ON 'PRESS-TO-TEST')	
A.	Defective wiring between light socket and valve.	Check for continuity through noted wiring. If no continuity, repair or replace wiring.
B.	Defective switch in valve.	Replace valve.

REFUEL PILOT VALVES - MAINTENANCE PRACTICES

1. Removal/Installation ASB Tank Refuel Pilot Valve (see Figure 201)

   A. Equipment Required - None.

   B. Prepare for Replacement of Valve.

      (1) Defuel corresponding anti-shock body tank; refer to Chapter 12, SERVICING.

      (2) Inert tank; refer to 28-1-0.

      WARNING: OBSERVE TANK ENTRANCE PRECAUTIONS: REFER TO 28-1-0.

   C. Remove valve.

      (1) Identify (PT, P, S and ST) and disconnect four three-eights-inch lines from valve.

      (2) Remove four attaching screws from bottom of valve; remove valve. (Retain spacers on inboard valve for installation.)

   D. Install Valve.

      (1) Position valve on mounting bracket with line ports facing outboard. Install screws, washers and spacers.

      (2) Connect four three-eighths-inch lines to PT, P, S and ST ports of valve, as identified during removal.

      (3) Clean fuel tank; refer to 28-1-0.

      (4) Refuel tank; refer to Chapter 12, SERVICING.

      NOTE: Test valve as part of refueling precheck, as outlined in Chapter 12, SERVICING.

2. Removal/Installation Wing Center Section Tank Refuel Pilot Valve (see Figure 201)

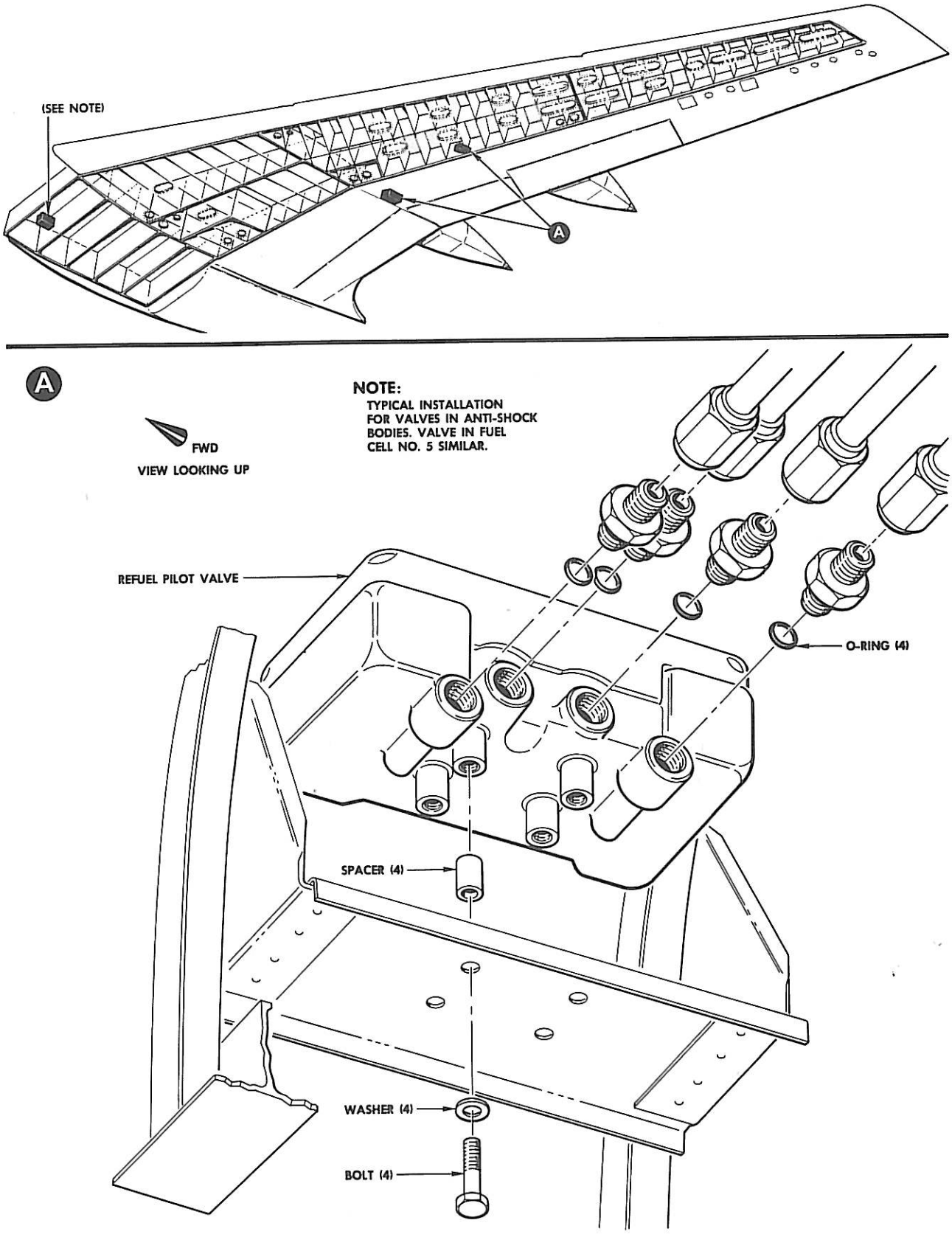
   A. Equipment Required - None.

   B. Prepare for Replacement of Valve.

      (1) Defuel wing center section tank; refer to Chapter 12, SERVICING.

      (2) Inert tank; refer to 28-1-0.

      WARNING: Observe all tank entrance precautions when ENTERING TANKS: REFER TO 28-1-0.



Refuel Pilot Valve Installation
Figure 201

C. Remove valve.

(1) Identify four three-eighths-inch lines at valve (PT, P, S, and ST), and disconnect lines.

(2) Remove four attaching screws and remove valve.

D. Install Valve.

(1) Position valve on mounting bracket with ports facing outboard. Install four mounting screws, washers and spacers.

(2) Connect four three-eighths-inch lines to PT, P, S, and ST ports of valve as identified during removal.

(3) Clean fuel tank cell; refer to 28-1-0.

(4) Refuel tank; refer to Chapter 12, SERVICING.

NOTE: Test valve as part of refueling precheck, as outlined in Chapter 12, SERVICING.

WING TANK REFUEL SHUTOFF VALVES - MAINTENANCE PRACTICES

1. Removal/Installation Refuel Shutoff Valve (see Figure 201)

   A. Equipment Required - None.

   B. Prepare for Replacement of Valve.

      (1) Defuel corresponding tank; refer to Chapter 12, SERVICING.

      NOTE: Defuel both tanks on corresponding wing if removing inboard valve.

      (2) Inert tank; refer to 28-1-0.

      (3) Remove access panel nearest valve.

      WARNING: OBSERVE TANK ENTRANCE PRECAUTIONS: REFER TO 28-1-0.

   C. Remove Refuel Shutoff Valve.

      (1) Disconnect two backpressure control lines from top of shutoff valve.

      (2) Remove four bolts from each end of shutoff valve and remove valve and seals. (Retain seals for installation if serviceable.)

   D. Install Refuel Shutoff Valve.

      (1) Clean mating surfaces of seals, shutoff valve, and valve adjoining surfaces.

      (2) Position valve between adjoining parts with control line ports at top and FLOW arrow pointing toward adjoining bellmouth assembly.

      (3) Insert a seal at one end of valve and insert two bolts to hold valve and seal in place. Slide other seal in place at opposite end of valve. Use care to prevent damaging seal.

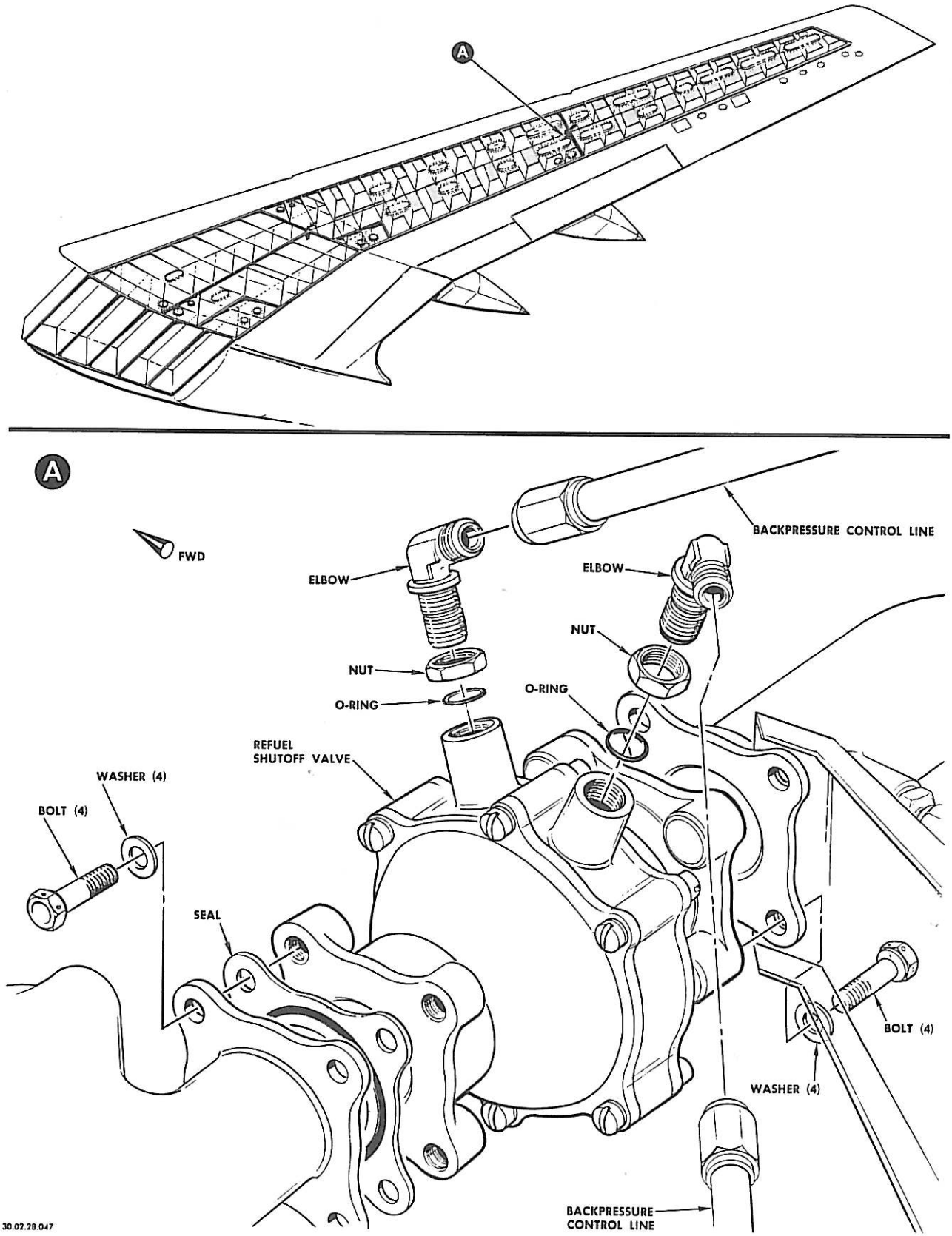
      (4) Install all valve attachment bolts.

      (5) Connect control lines at top of valve.

      (6) Clean fuel tank; refer to 28-1-0.

      (7) Refuel tank; refer to Chapter 12, SERVICING.

      NOTE: Test valve as part of refueling precheck, as outlined in Chapter 12, SERVICING.



Wing Tank Refuel Shutoff
Valve Installation
Figure 201

STOP-FUEL SOLENOID VALVES - MAINTENANCE PRACTICES

1. Removal/Installation Stop-Fuel Solenoid Valve (see Figure 201)

   A. Equipment Required - None.

   B. Prepare for Replacement of Valve.

      (1) Defuel corresponding wing or inboard ASB tank; refer to Chapter 12, SERVICING.

      (2) Inert tank; refer to 28-1-0.

      (3) Remove applicable wing or ASB access panel.

      WARNING: OBSERVE TANK ENTRANCE PRECAUTIONS; REFER TO 28-1-0.

   C. Remove Valve.

      (1) Open and attach warning tag to corresponding REFUEL VALVES circuit breaker, on main circuit breaker panel.

      (2) Disconnect electrical plug from valve.

      (3) Disconnect two refuel control lines from valve.

      (4) Remove four bolts attaching valve to rear spar (or to ASB bulkhead) and remove valve. (Retain seal for installation, if serviceable.)

   D. Install Valve.

      (1) Clean mating surfaces of valve, seal, and rear spar or bulkhead.

      (2) Position seal and valve at spar or bulkhead opening so that valve ports align with refuel control lines; install four attachment bolts and washers.

      (3) Connect two refuel control lines to valve.

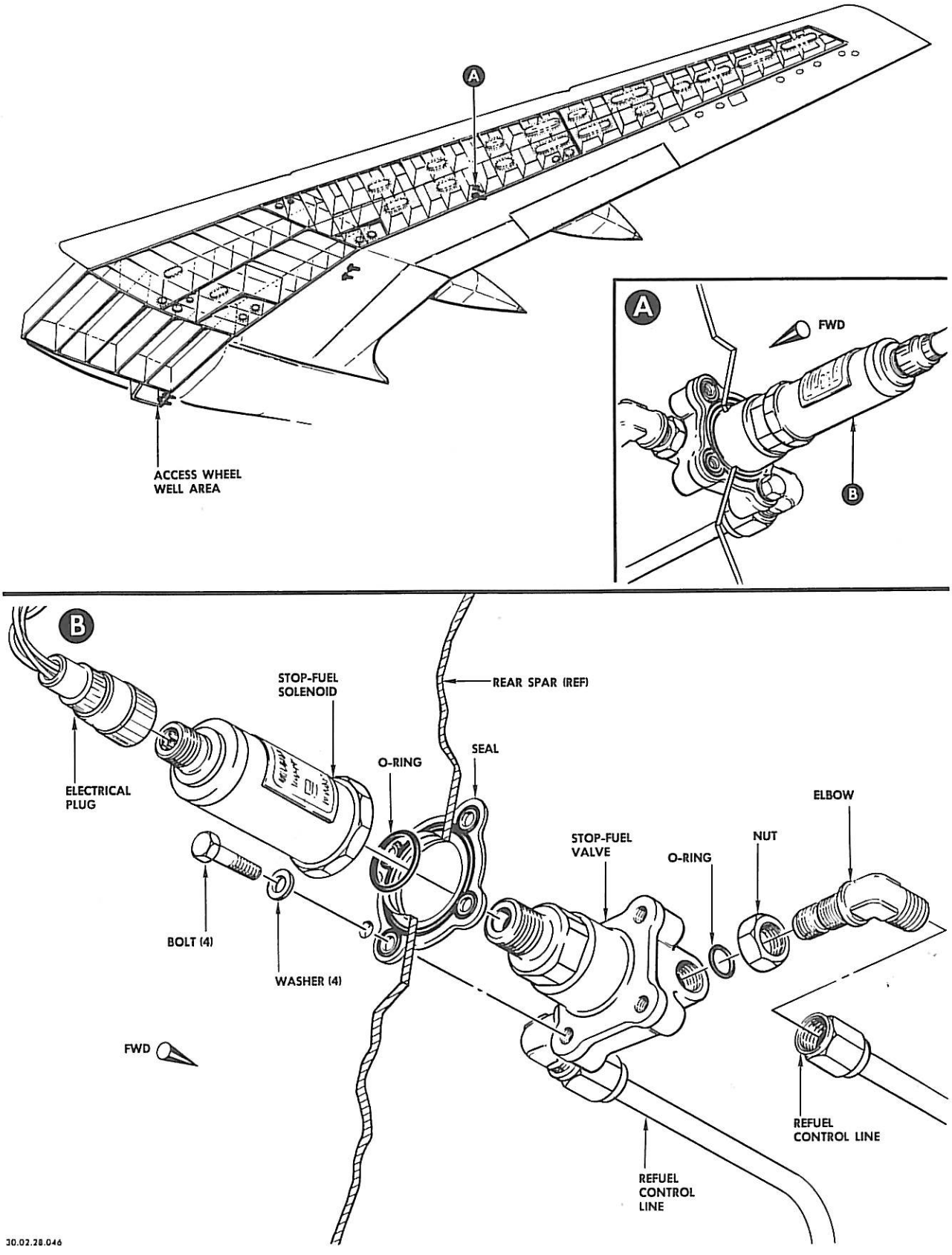
      (4) Clean tank; refer to 28-1-0.

      (5) Connect electrical plug to valve.

      (6) Open and remove warning tag from corresponding REFUEL VALVES circuit breaker.

      (7) Refuel tank; refer to Chapter 12, SERVICING.

      NOTE: Test solenoid valve as part of refueling precheck, as outlined in Chapter 12, SERVICING.



Stop-Fuel Solenoid Valve Installation
Figure 201

2. Removal/Installation Stop-Fuel Valve Solenoid and Gate Assembly (see Figure 202)

A. Equipment Required - None.

B. Remove Solenoid and Gate Assembly.

(1) Open and attach warning tag to corresponding REFUEL VALVES circuit breaker.

(2) Disconnect electrical plug from valve.

(3) Hold valve body with wrench placed on wrench flats adjacent to valve attachment nut.

(4) Place another wrench on flats on solenoid housing and loosen and remove housing.

(5) Pull out solenoid core and gate assembly.

NOTE: If solenoid and gate assembly is to be replaced with a new one, measure dimension as outlined in step C.(1) before discarding old one.

C. Install Solenoid and Gate Assembly.

(1) Make sure inside of valve body and parts to be installed are clean.

NOTE: If installing a new solenoid and gate assembly, it must be adjusted to the same length as the old one. Proceed as follows:

(a) Insert solenoid and gate assembly in housing without end spring, so that solenoid bottoms in housing.

(b) With solenoid bottomed, measure from end of housing to cotter pin hole; see Figure 202. If this dimension is not same as on the old solenoid and gate assembly, loosen set screw and adjust shaft as required; tighten set screw.

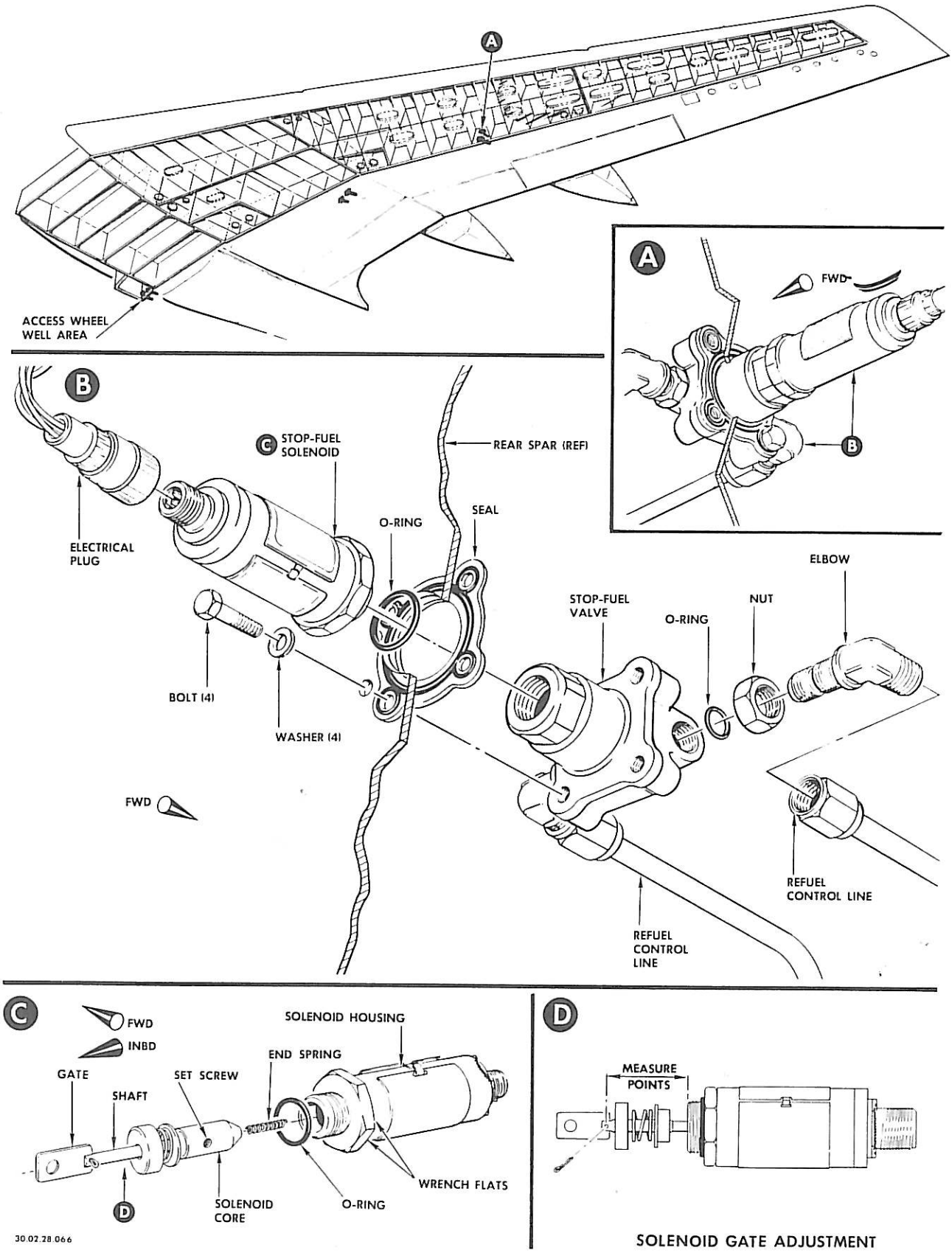
(2) Apply a light coat of petrolatum, Specification VV-P-236, or equivalent, over gate.

(3) Insert solenoid core and gate assembly in valve body so that gate enters slot in valve body and push assembly until it bottoms.

(4) Install a new O-ring on solenoid housing.

(5) Slip solenoid housing over solenoid, screw in place, and tighten.

(6) Connect electrical plug.



SOLENOID GATE ADJUSTMENT

Stop-Fuel Valve Solenoid and
Gate Installation
Figure 202

(7) Remove warning tag and close circuit breakers.

NOTE: Test solenoid as part of refueling precheck, as outlined in in Chapter 12, SERVICING.

DEFUEL VALVES - MAINTENANCE PRACTICES

1. Removal/Installation Defuel Valve Motor and Gear Train (see Figure 201)

   A. Equipment Required - None.

   B. Prepare for Replacement of Defuel Valve Motor and Gear Train.

      (1) If motor and gear train for left-hand defuel valve are to be replaced, close the following valves to minimize fuel drainage from adjacent lines:

         (a) Engine No. 1 and No. 2 crossfeed valves.

         (b) Left auxiliary center tank and wing crossfeed valve.

      (2) Close corresponding valves if motor and gear train for right-hand defuel valve are to be replaced.

         NOTE: Replacement procedures for the defueling valve motor and gear train apply also to replacement of the motor and gear train for the system's crossfeed valves and auxiliary center tank and wing crossfeed valves. If replacing the motor and gear train for any of these, close the valves on each side to minimize drainage from adjacent lines.

      (3) Open and attach warning tag to corresponding DEFUEL VALVE and REFUEL VALVE circuit breakers, on main circuit breaker panel.

   C. Remove Motor, Gear Train and Gate.

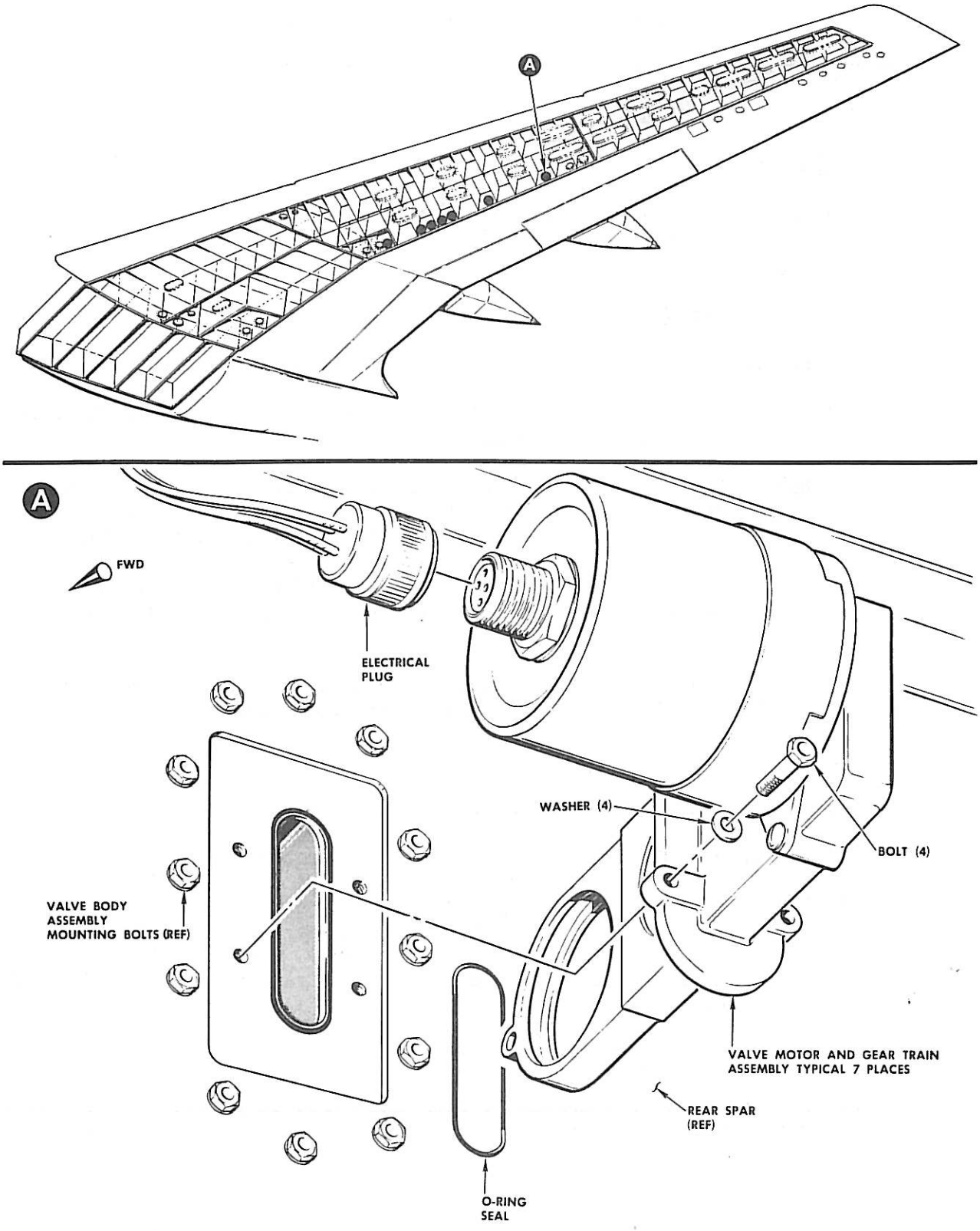
      (1) Open trailing edge access door.

      (2) Disconnect electrical plug from valve's motor.

      (3) Remove four bolts from housing at rear spar, with suitable container in position to trap residual fuel in lines, and move assembly away from rear spar to draw gate out of valve. When fuel is drained from lines, remove motor, gear train and gate assembly. (Discard rectangular O-ring, if unserviceable.)

   D. Install Motor, Gear Train and Gate.

      (1) Lubricate new rectangular O-ring and place in position in groove at rear spar. (Oil, Specification MIL-L-7808, or equivalent.)


A
A
FWD
ELECTRICAL PLUG
WASHER (4)
BOLT (4)
VALVE BODY ASSEMBLY MOUNTING BOLTS (REF)
VALVE MOTOR AND GEAR TRAIN ASSEMBLY TYPICAL 7 PLACES
REAR SPAR (REF)
O-RING SEAL
30.02.28.057

(2) Place motor, gear train and gate assembly in position, sliding gate carefully through O-ring, and install four bolts.

NOTE: Install motor and gear train for all valves, except the defuel valves and engine No. 2 or 3 crossfeed valves, so that motor points outboard. Install motor for noted valves so that motor points inboard.

(3) Connect electrical plug to motor receptacle.

(4) Remove warning tags and close corresponding circuit breakers.

(5) Test valve; refer to Adjustment/Test.

2. Removal/Installation Defuel Valve (see Figure 202)

A. Equipment Required - None.

B. Prepare for Replacement of Defuel Valve.

(1) Defuel corresponding wing tank; refer to Chapter 12, SERVICING.

(2) Inert tank; refer to 28-1-0.

(3) Remove access panel.

WARNING: OBSERVE TANK ENTRANCE PRECAUTIONS; REFER TO 28-1-0.

C. Remove Valve.

NOTE: The following replacement procedures are also applicable for line valves, crossfeed valves, and auxiliary center tank and wing crossfeed valves.

(1) Open and attach warning tag to corresponding DEFUEL VALVE and REFUEL VALVE circuit breakers, on main circuit breaker panel.

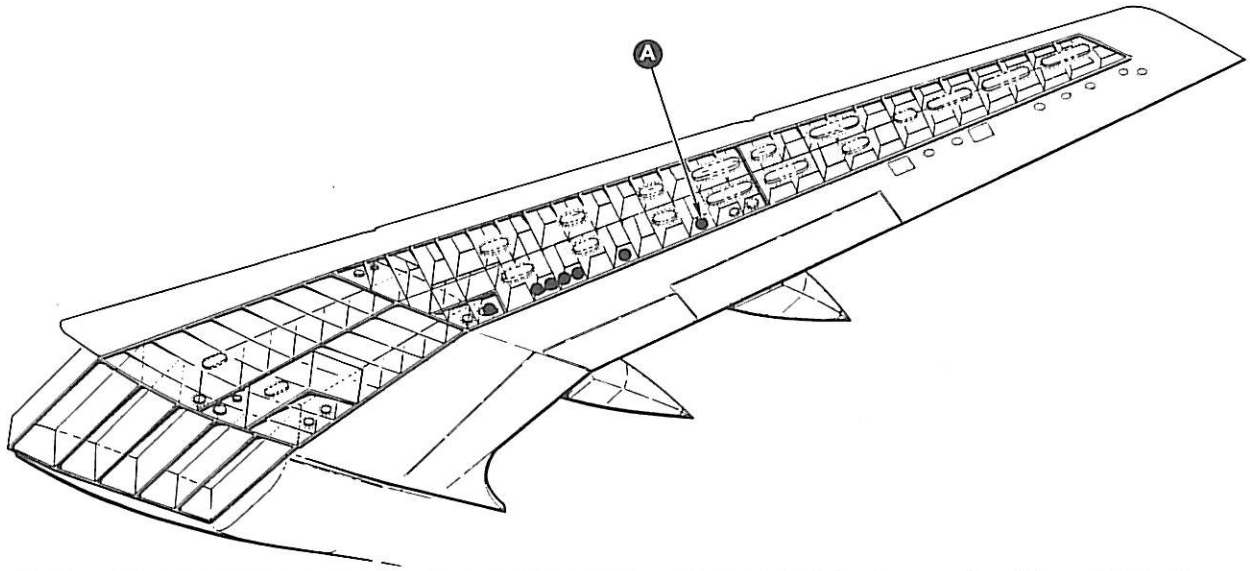
NOTE: If tank line valve, crossfeed valve, or auxiliary center tank and wing crossfeed valve is to be replaced, open and attach warning tag to (respectively): FUEL LINE VALVE, FUEL CROSSFEED VALVE, or FUEL AUX CTR SECT CROSSFEED circuit breaker instead of circuit breakers for defuel valve.

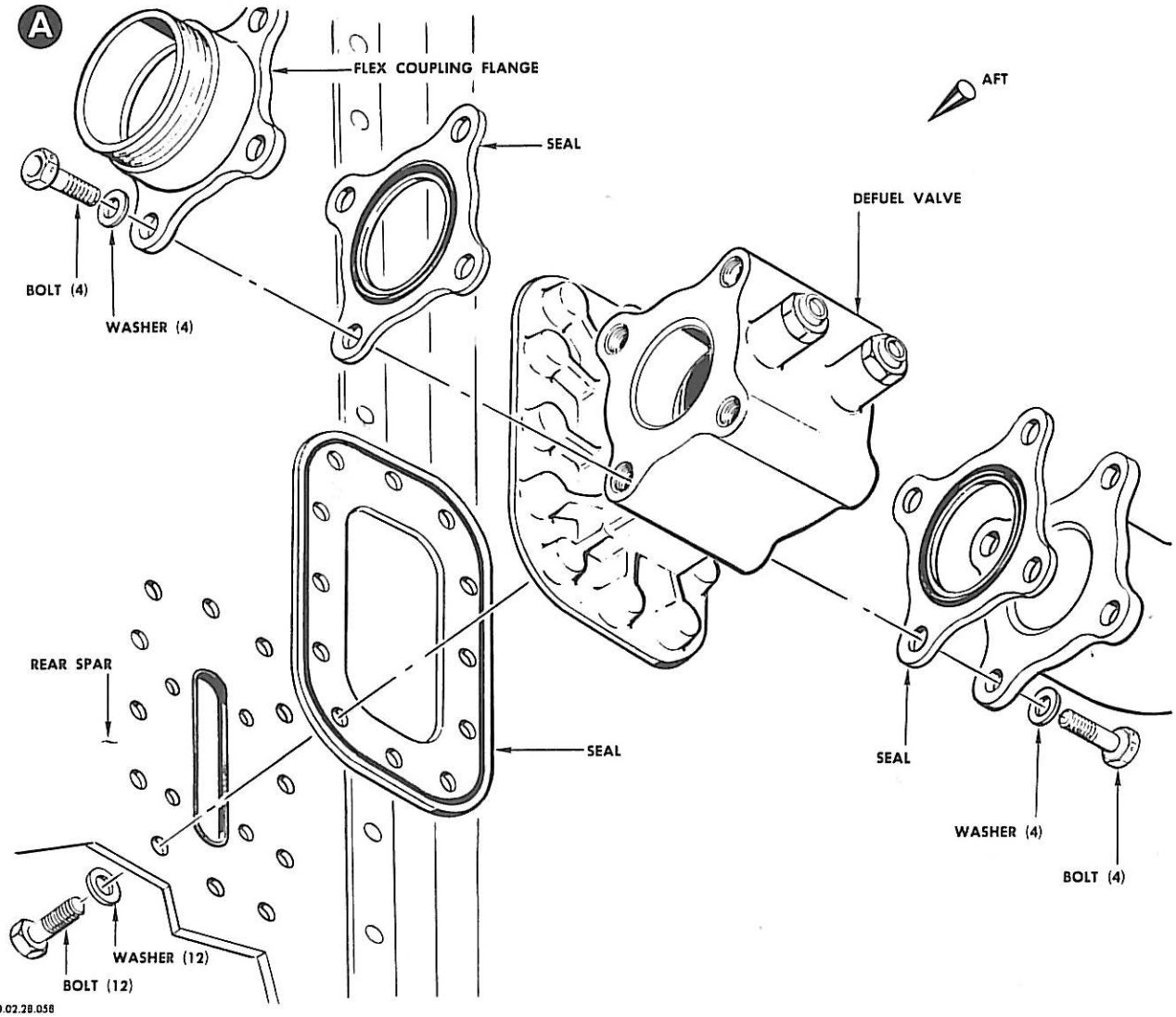
(2) Remove valve's motor and gear train assembly; refer to Removal/Installation Defuel Valve Motor and Gear Train.

(3) Remove four bolts from valve flange and attaching line flange.

(4) Disconnect Wiggins flex coupling; refer to 28-0.

(5) Remove 12 bolts from valve mounting flange at rear spar. Carefully remove valve from position between mounting flange and Wiggins flex coupling. Remove Wiggins flex coupling adapter flange and seal, and hold for installation. Discard seals, if unserviceable.





Defuel Valve Body Assembly Installation
Figure 202

D. Install Valve.

(1) Carefully clean the two seals, O-ring for Wiggins flex coupling, valve mating flanges, and tubing flange and rear spar mating surface. Place valve in position and install 12 bolts in rear spar and flange, with seal in place.

(2) Clean seal and mating surfaces, and install Wiggins flex coupling adapter flange on valve.

(3) Connect Wiggins flex coupling; refer to 28-0. Install four bolts in mating flanges at other side of valve, with seal in place.

(4) Install motor and gear train assembly; refer to Removal/Installation Defuel Valve Motor and Gear Train.

(5) Clean fuel tank; refer to 28-1-0.

(6) Remove warning tag(s) from circuit breakers and close circuit breakers.

(7) Refuel tank; refer to Chapter 12, SERVICING.

(8) Test valve; refer to Adjustment/Test.

3. Adjustment/Test - Defuel Valve-Functional Test

A. Equipment Required. External source of 115/200-volt, 3-phase, 400 cps, ac electrical power.

B. Prepare for Functional Test. Connect external source of electrical power to airplane; refer to Chapter 24, ELECTRICAL POWER.

C. Perform Functional Test.

(1) Position DEFUEL VALVE switch on flight engineer's fuel control panel at OPEN. Check that manual operation lever on valve moves to the OPEN position, and that VALVE OPEN warning light on flight engineer's fuel control panel illuminates.

(2) Position switch at CLOSE. Check that manual operation lever on valve moves to the CLOSE position, and that VALVE OPEN warning light extinguishes.

(3) Remove external electrical power from airplane.

CENTER TANK REFUEL SHUTOFF VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Center Tank Refuel Shutoff Valve (see Figure 201)

A. Equipment Required - None.

B. Prepare for Replacement of Valve.

(1) Defuel center tank; refer to Chapter 12, SERVICING.

(2) Inert tank; refer to 28-1-0.

(3) Remove center tank access door from rear spar, left side.

WARNING: OBSERVE TANK ENTRANCE PRECAUTIONS; REFER TO 28-1-0.

C. Remove Refuel Shutoff Valve.

(1) Disconnect two backpressure control lines from shutoff valve.

(2) Remove four bolts attaching refuel shutoff valve to adapter on lower side of center tank selector valve.

(3) Remove four bolts attaching lower side of refuel shutoff valve to fuel outlet tube; remove refuel shutoff valve. (Retain seal for installation, if serviceable.)

D. Install Refuel Shutoff Valve.

(1) Clean mating surfaces of shutoff valve, center tank selector valve adapter, fuel outlet tube, and seal.

(2) Position shutoff valve between fuel outlet tube and center tank selector valve adapter, with backpressure control line ports pointing as shown on Figure 201.

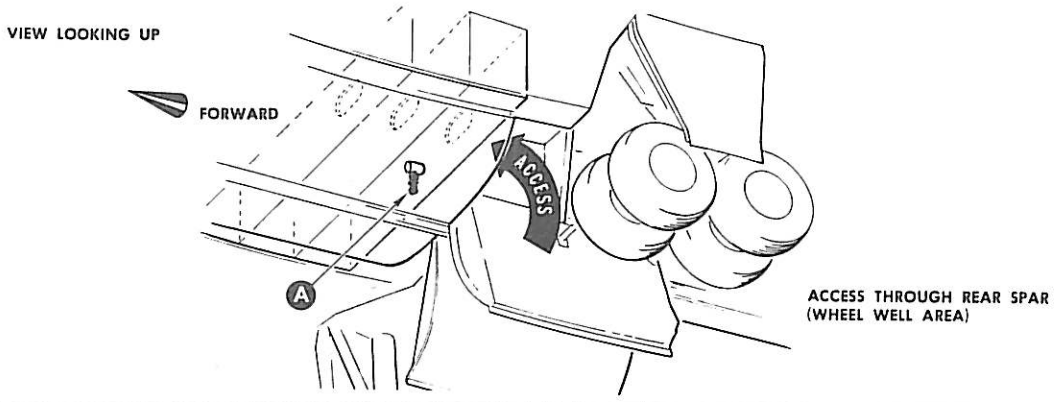
(3) Position seal at upper side of shutoff valve and install eight bolts.

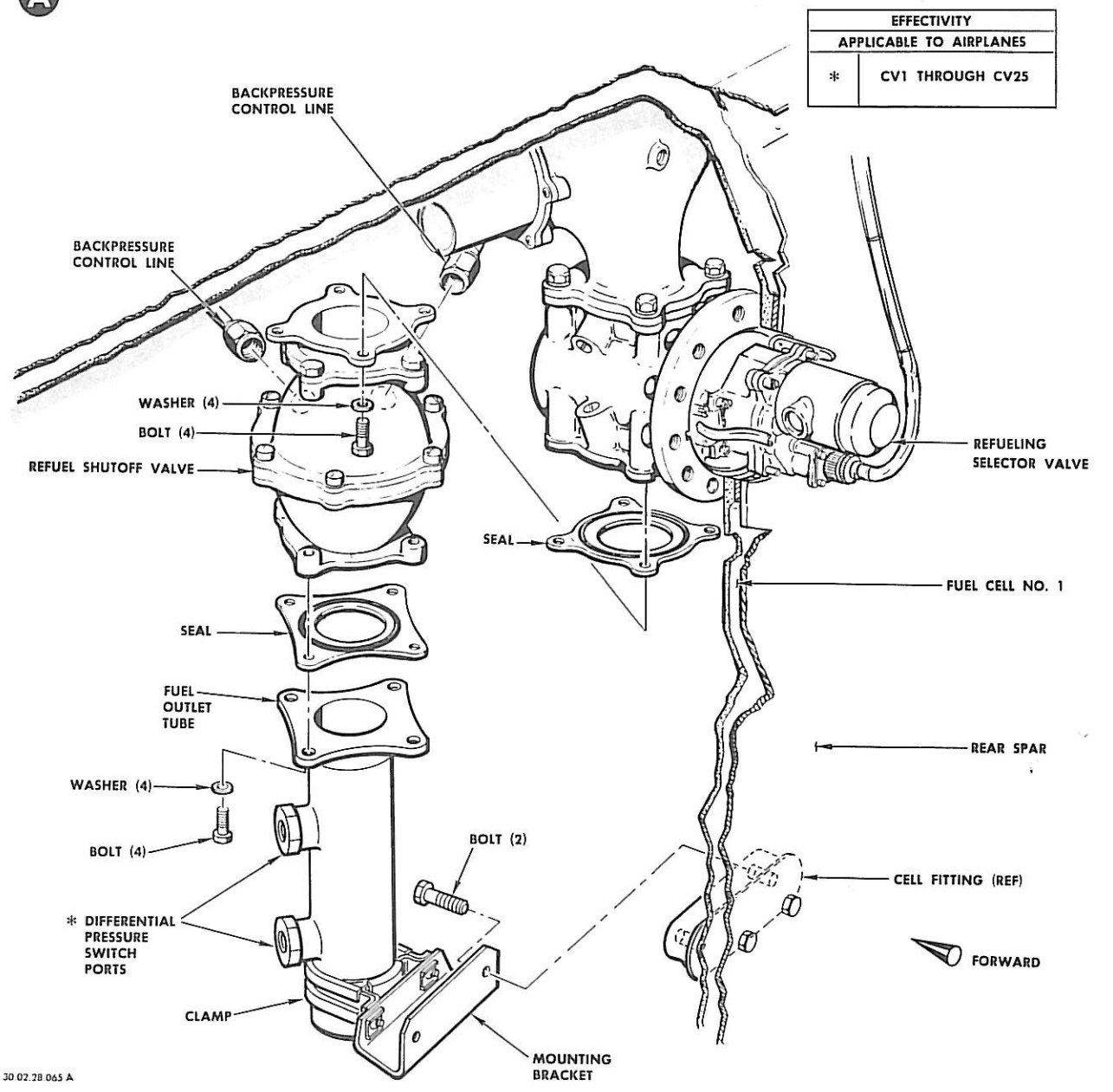
(4) Connect backpressure control lines to shutoff valve.

(5) Clean fuel cell; refer to 28-1-0.

(6) Refuel center tank; refer to Chapter 12, SERVICING.

NOTE: Test valve as part of refueling check, as outlined in Chapter 12, SERVICING.





Center Tank Refuel Shutoff
Valve Installation
Figure 201

CENTER TANK REFUELING SELECTOR VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Center Tank Refueling Selector Valve Motor and Sleeve (see 28-3-3, Figure 201)

   A. Equipment Required - None.

   B. Prepare for Replacement of Motor and Sleeve. Open and attach warning tag to REFUEL VALVES (LH and RH) circuit breakers, on main circuit breaker panel.

   C. Remove Motor and Sleeve Assembly.

      (1) Disconnect electrical plug from valve's motor.

      (2) Unlock sleeve by squeezing two lock levers, rotate motor and sleeve assembly 90 degrees counterclockwise and pull outward to remove. (Discard O-ring.)

      (3) Cover rear spar opening to prevent entrance of foreign matter.

   D. Install Motor and Sleeve Assembly.

      (1) Install new O-ring (MS29513-233) on sleeve assembly. Lubricate O-ring with petrolatum, Specification VV-P-236, or equivalent.

      (2) Position motor and sleeve assembly so that the cam aligns with cut-out in outer sleeve and index pins align with slots in valve body. Push motor and sleeve assembly in as far as possible and rotate 90 degrees clockwise. Make sure that motor and sleeve assembly is locked in place, with lock levers engaged in slots in valve body.

      (3) Connect electrical plug to motor.

      (4) Close REFUEL VALVES (LH and RH) circuit breakers.

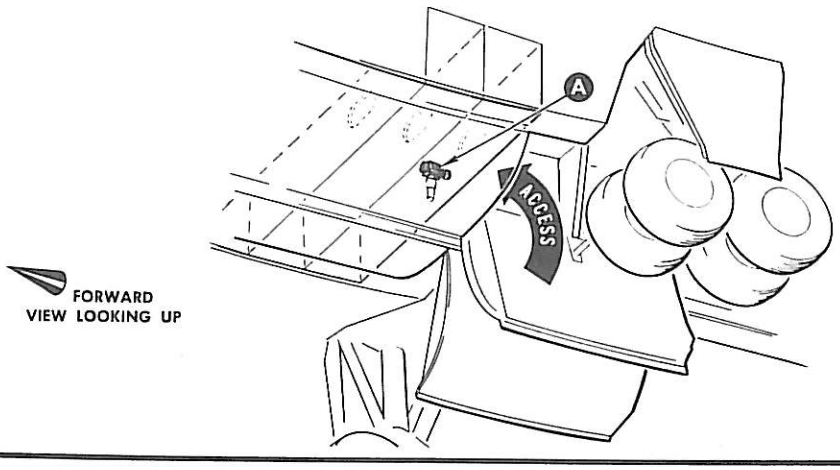
      (5) Test valve; refer to Adjustment/Test.

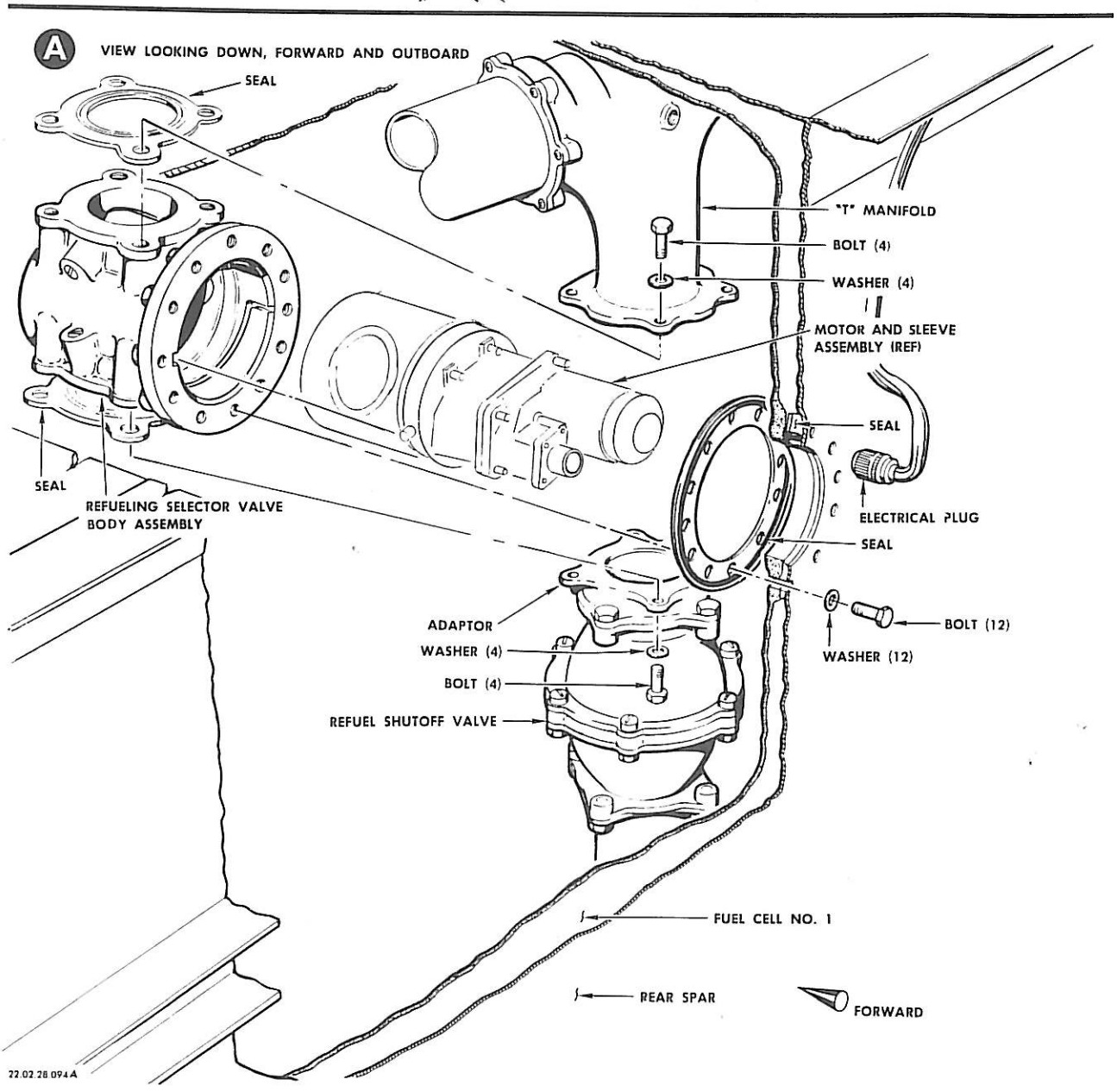
2. Removal/Installation Center Tank Refueling Selector Valve (see Figure 201)

   A. Equipment Required - None.

   B. Prepare for Replacement of Valve.

      (1) Defuel center tank; refer to Chapter 12, SERVICING.





Center Tank Refueling Selector
Valve Installation
Figure 201

(2) Inert tank; refer to 28-1-0.

WARNING: OBSERVE TANK ENTRANCE PRECAUTIONS; REFER TO 28-1-0.

(3) Open and attach warning tag to REFUEL VALVES (LH and RH) circuit breakers, on main circuit breaker panel.

C. Remove Refueling Selector Valve.

(1) Remove motor and sleeve assembly; refer to item 1.C.

(2) Place cardboard or other suitable protective covering in floor of fuel cell No. 1.

(3) Remove four bolts attaching upper side of valve to tee manifold.

(4) Remove four bolts attaching lower side of valve to adapter at top of refuel shutoff valve.

(5) Remove 12 bolts attaching valve to rear spar.

(6) Carefully slide valve forward and remove. (Retain seals for installation, if serviceable.)

(7) Cover openings in valve, adapter, tee manifold, and rear spar.

D. Install Refueling Selector Valve.

(1) Position valve with a seal between valve and rear spar and install 12 attachment bolts through rear spar into valve.

(2) Leak test valve installation; refer to 28-1-1, Adjustment/Test Center Section Fuel Cells - (Cells Installed in Airplane).

(3) Insert seal between valve and adapter and install four bolts.

(4) Raise tee manifold slightly and carefully insert seal between valve and tee manifold. Install four attachment bolts.

(5) Install motor and sleeve assembly; refer to item 1.D.

(6) Connect electrical plug to valve.

(7) Close REFUEL VALVES (LH and RH) circuit breakers.

(8) Test valve; refer to Adjustment/Test.

(9) Make sure fuel cell is free of all foreign matter and replace access panel on rear spar.

(10) Refuel center tank; refer to Chapter 12, SERVICING.

3. Adjustment/Test Center Tank Refueling Selector Valve - Functional Test

A. Equipment Required. External source of 115/200-volt, 3-phase, 400 cps, ac electrical power.

B. Prepare for Functional Test. Connect external source of electrical power to airplane; refer to Chapter 24, ELECTRICAL POWER.

C. Perform Functional Test.

(1) Manually position valve to the CLOSED position.

(2) Place SELECTOR VALVE switch on refuel control panel in the OPEN position. Check that manual operation lever on valve moves to the OPEN position, and that VALVE OPEN light on the control panel illuminates.

(3) Place switch in the CLOSED position. Check that manual operation lever moves to the CLOSED position, and that VALVE OPEN light extinguishes.

(4) Remove external electrical power from airplane; refer to Chapter 24, ELECTRICAL POWER.

REFUEL LINE NIPPLE - MAINTENANCE PRACTICES

1. Removal/Installation Refuel Line Nipple (see Figure 201)

   A. Equipment Required - None.

   B. Prepare for Nipple Replacement.

      (1) Defuel center tank and inboard tank system of wing containing nipple to be replaced; refer to Chapter 12, SERVICING.

      (2) Inert tank; refer to 28-1-0.

   C. Remove Refuel Line Nipple.

      (1) Disconnect drain line and refuel line from outboard nipple.

      (2) Remove refuel line between inboard nipple and center tank refueling selector valve; refer to 28-2-6.

      (3) Remove six bolts and inboard nipple in cell No. 1.

      (4) Pull cell fitting inboard and tape seal located between cell and bulkhead to prevent its dropping when two slotted screws are removed. IF SEAL DROPS IT MAY BE NECESSARY TO REMOVE THE CELL TO RETRIEVE THE SEAL.

      (5) Remove two slotted screws and remove outboard nipple. Retain all seals for installation, if serviceable.

   D. Install Refuel Line Nipple.

      (1) Station one man in the center tank and another in the inboard tank.

      (2) Position outboard nipple with a seal between nipple and bulkhead and install two slotted screws. Remove tape installed in step C.(4).

      (3) Position inboard nipple with a seal between nipple and cell and install six attachment bolts.

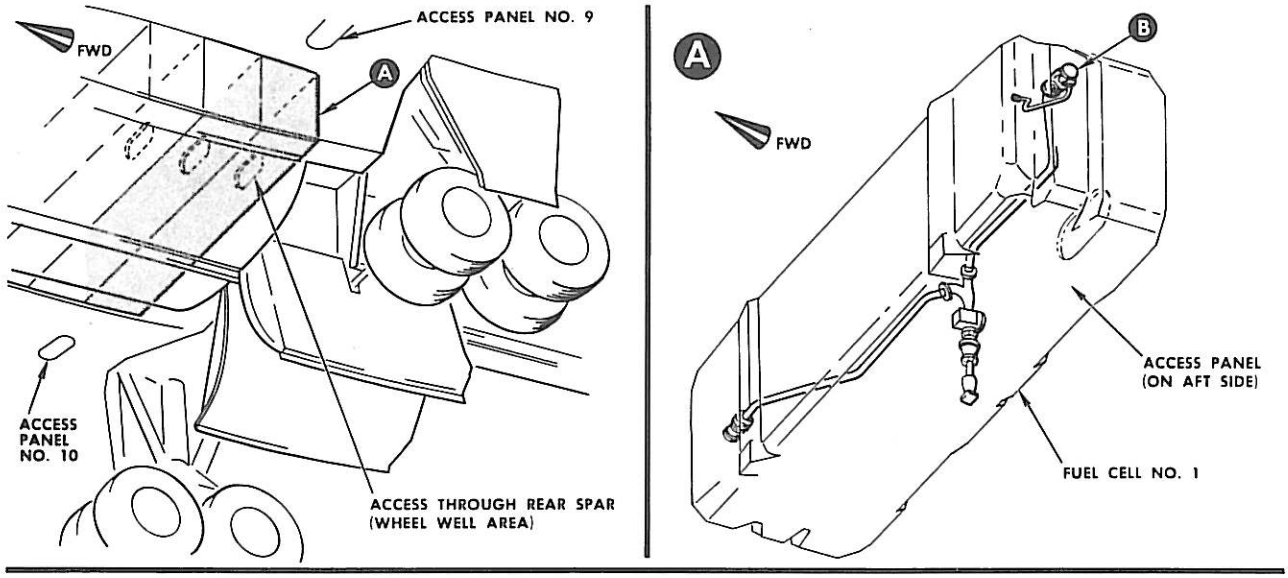
      (4) Leak test nipple installation; refer to 28-1-1, Adjustment/Test Center Section Fuel Cells - Leak Test (Cells Installed in Airplane).

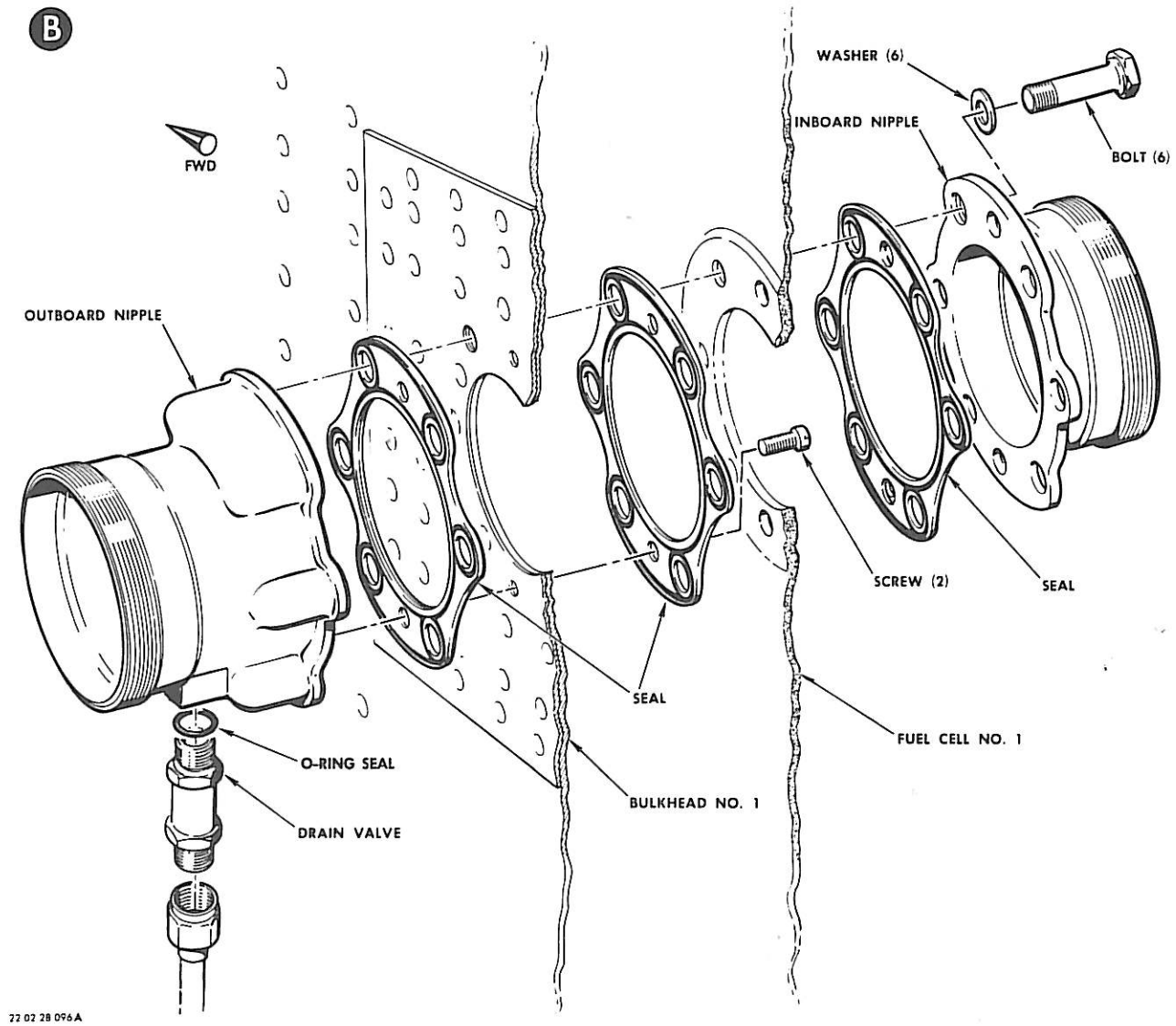
      (5) Connect the refuel line and the drain line to outboard nipple; refer to 28-0, Removal/Installation Flex Coupling.

      (6) Install refuel line between nipple and center tank refueling selector valve; refer to 28-2-6.

      (7) Clean fuel tanks; refer to 28-1-0.

      (8) Refuel tanks; refer to Chapter 12, SERVICING.


FWD
ACCESS PANEL NO. 9
A
ACCESS PANEL NO. 10
ACCESS THROUGH REAR SPAR (WHEEL WELL AREA)
A
FWD
B
ACCESS PANEL (ON AFT SIDE)
FUEL CELL NO. 1


B
FWD
WASHER (6)
INBOARD NIPPLE
BOLT (6)
OUTBOARD NIPPLE
SCREW (2)
SEAL
SEAL
FUEL CELL NO. 1
O-RING SEAL
BULKHEAD NO. 1
DRAIN VALVE
22 02 28 096A

REFUEL CONTROL LINE STRAINERS - MAINTENANCE PRACTICES

1. Removal/Installation Refuel Control Line Strainer (see Figure 201)

   A. Equipment Required - None.

   B. Prepare for Replacement of Strainer.

      (1) Defuel corresponding tank; refer to Chapter 12, SERVICING.

      (2) Inert tanks; refer to 28-1-0.

      (3) Remove access panel.

      WARNING: OBSERVE TANK ENTRANCE PRECAUTIONS; REFER TO 28-1-0.

   C. Remove Refuel Control Line Strainer.

      (1) Disconnect lines from each end of strainer.

      (2) Remove strainer mounting clamp and remove strainer assembly.

      (3) Clean and check screen for condition; refer to Cleaning/Painting Refuel Control Line Strainer.

   D. Install Refuel Control Line Strainer.

      (1) Position strainer assembly between lines with arrow on body pointing in the direction the refuel pilot valve.

      (2) Connect lines to both ends of strainer finger tight.

      (3) Install mounting clamp on strainer.

      (4) Tighten line fittings on strainer.

      (5) Clean fuel tank; refer to 28-1-0.

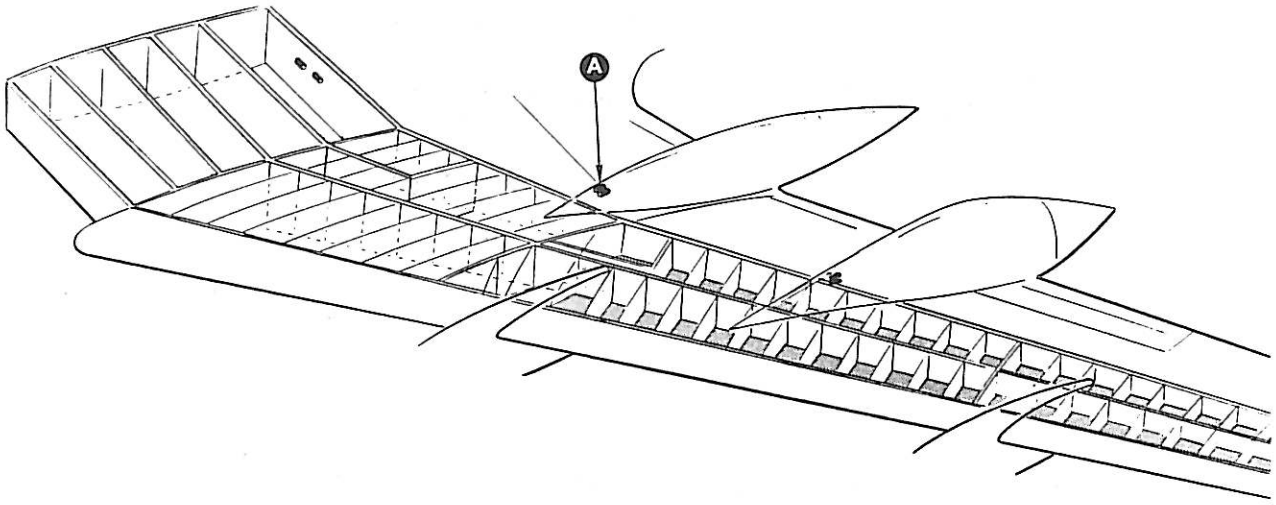
2. Cleaning/Painting Refuel Control Line Strainer

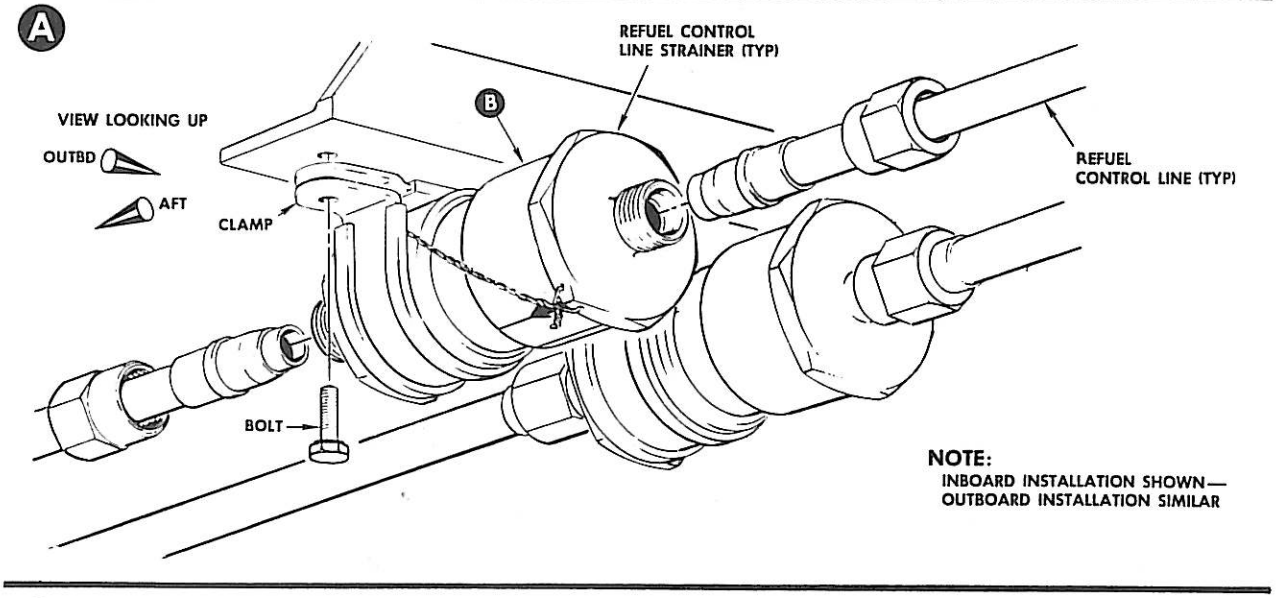
   A. Clean Strainer Screen.

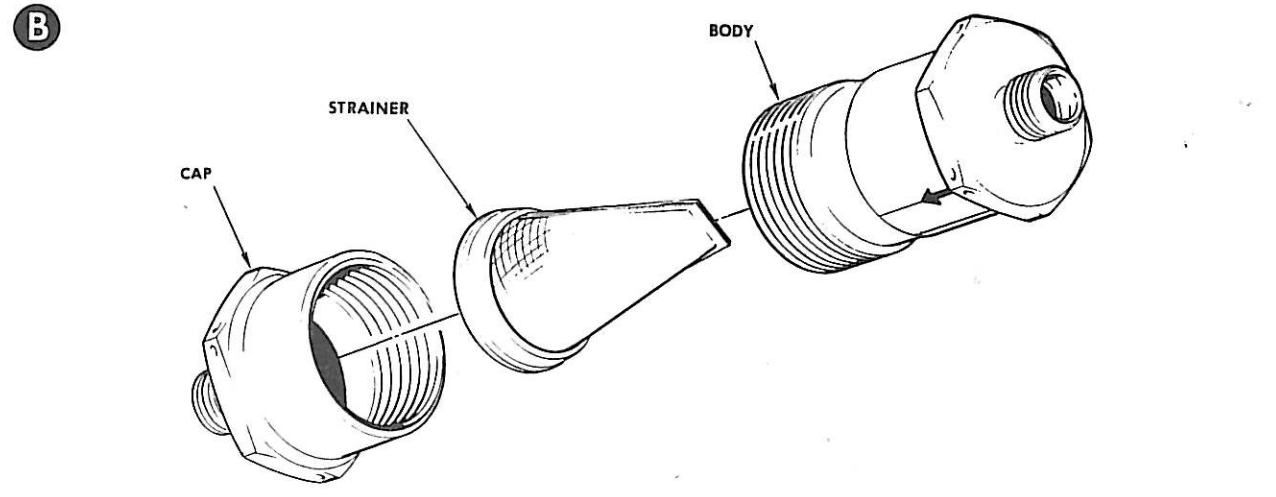
      (1) Remove safety wire and disassemble strainer by holding wrench flats on one end and unscrewing wrench flats at opposite end. (Discard O-ring.)

      (2) Clean strainer screen and internal area of strainer body.

      NOTE: Replace screen if it shows evidence of corrosion or other damage.







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Refuel Control Line Strainer Installation
Figure 201

(3) Install new O-ring in strainer body.

(4) Install cleaned or new screen in strainer body with pointed end of screen pointing opposite of arrow on strainer body.

(5) Screw two halves of strainer body together and tighten.

(6) Install safety wire on strainer body.

GRAVITY REFUELING ADAPTER AND CHECK VALVES - MAINTENANCE PRACTICES

1. Removal/Installation Gravity Refueling Adapter and Check Valve (see Figure 201)

A. Equipment Required.

(1) Non-sparking, open-end hex wrench, 4.25 inches across flats, 14-inch handle.

(2) Special 3-lug wrench, Convair P/N 22J 77, or equivalent.

(3) Putty, EC 1653B (manufactured by 3M Company, St. Paul 6, Minnesota).

B. Prepare for Replacement of Refueling Adapter and Check Valve.

(1) Defuel corresponding tank or anti-shock body; refer to Chapter 12, SERVICING.

(2) Inert tank or anti-shock body; refer to 28-1-0.

(3) Remove applicable access panel; see Figure 201

WARNING: OBSERVE TANK ENTRANCE PRECAUTIONS; REFER TO 28-1-0.

C. Remove Refueling Adapter and Check Valve.

(1) Remove putty between refueling adapter and ASB or wing upper surface skin.

(2) Hold check valve inside tank with open end hex wrench and unscrew adapter with special 3-lug wrench. (Discard O-ring and retain seal for installation, if serviceable.)

D. Install Refueling Adapter and Check Valve.

(1) Make sure all mating surfaces of seal, O-ring, check valve, refueling adapter, and wing opening are clean.

(2) Lubricate seal, O-ring, and first three threads of adapter with petrolatum, Specification VV-P-236.

(3) Install O-ring on adapter and position adapter in tank opening.

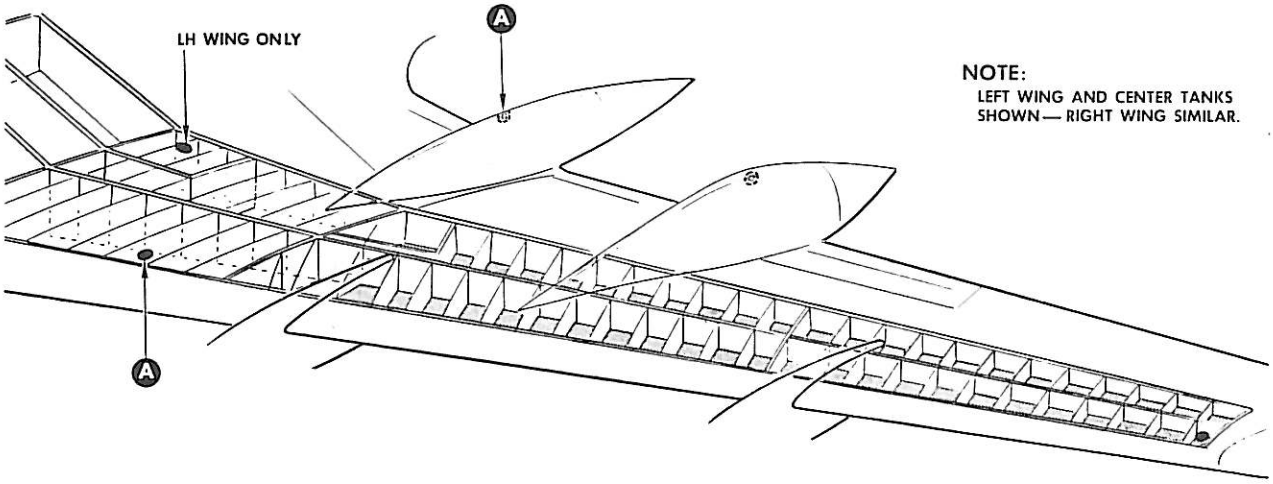
(4) Position seal and screw check valve onto adapter.

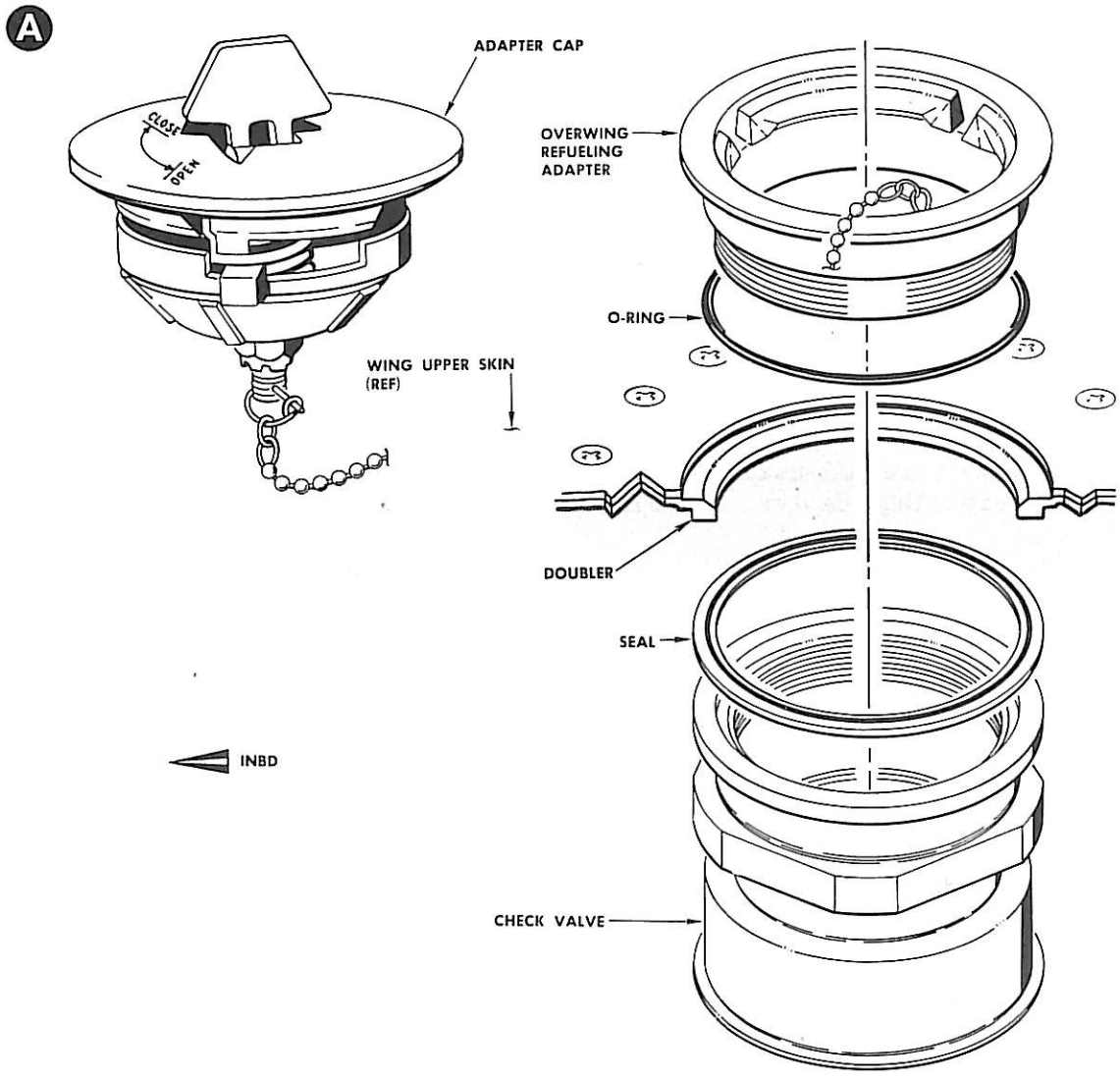
(5) Hold check valve with hex wrench and tighten adapter with special 3-lug wrench; torque to 80 to 85 foot-pounds. Index mark "V" on adapter must be directly aft after torqueing check valve and adapter.

(6) Fill void between adapter and wing upper skin flush with EC 1653B putty.

(7) Clean tank; refer to 28-1-0.

(8) Refuel tank; refer to Chapter 12, SERVICING.





30.30.28.076

Gravity Refuel Adapter and Check Valve Installation
Figure 201

PRESSURE REFUELING ADAPTER - MAINTENANCE PRACTICES

1. Removal/Installation Pressure Refueling Adapter (see Figure 201)

   A. Equipment Required - None.

   B. Prepare for Replacement of Refueling Adapter.

      (1) Defuel corresponding tank; refer to Chapter 12, SERVICING.

      (2) Inert tank; refer to 28-1-0.

      (3) Remove applicable access panel.

   C. Remove Refueling Adapter.

      (1) Disconnect flex coupling at top of adapter; refer to 28-0 for flex coupling procedure.

      (2) Remove (20) screws attaching adapter to wing lower surface; remove adapter. (Retain seal for installation, if serviceable.)

      (3) Cover wing opening to prevent entrance of foreign matter.

   D. Install Refueling Adapter.

      (1) Clean mating surfaces of adapter, wing lower skin doubler, and the seal.

      (2) Position adapter to align with tubing and place seal between adapter and wing lower skin doubler.

      (3) Install (20) attachment screws.

      (4) Connect tubing at top of adapter with flex coupling; refer to 28-0 for flex coupling procedure.

      (5) Clean tank; refer to 28-1-0.

      (6) Refuel tank; refer to Chapter 12, SERVICING.

      (7) Check installation for leakage.

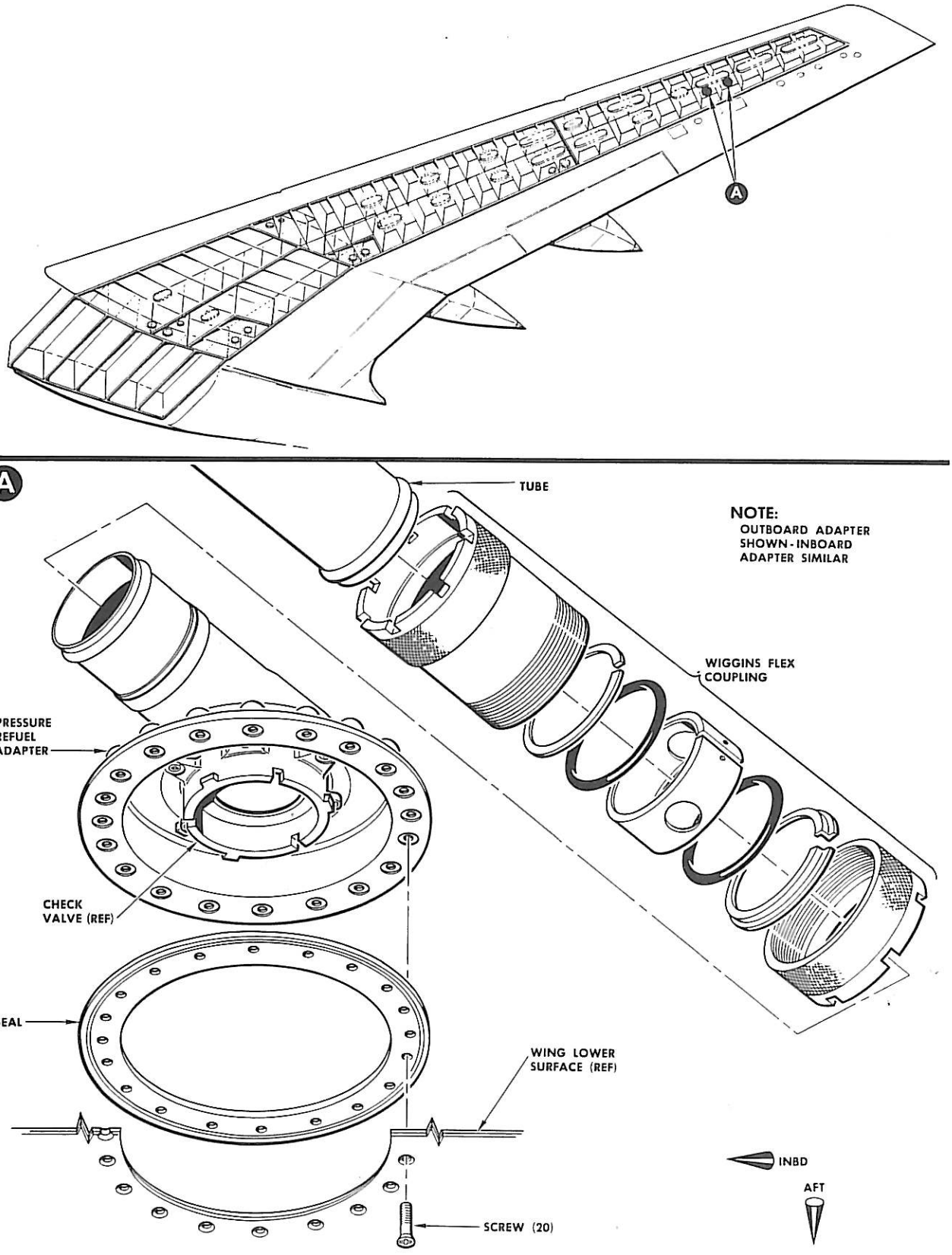
2. Removal/Installation Pressure Refueling Adapter Check Valve (see Figure 202)

   A. Equipment Required - None.

   B. Prepare for Replacement of Refueling Adapter Check Valve.

      (1) Defuel corresponding tank; refer to Chapter 12, SERVICING.

      (2) Inert tank; refer to 28-1-0.


A
TUBE
NOTE:
OUTBOARD ADAPTER
SHOWN-INBOARD
ADAPTER SIMILAR
WIGGINS FLEX
COUPLING
PRESSURE
REFUEL
ADAPTER
CHECK
VALVE (REF)
SEAL
WING LOWER
SURFACE (REF)
SCREW (20)
INBD
AFT
30.02.28.077

C. Remove Refueling Adapter Check Valve.

(1) Unfasten cap lock and remove cap.

(2) Unfasten cable clip fastener and detach cap from adapter.

(3) Remove six screws attaching check valve and withdraw check valve and flange assembly.

(4) Cover wing lower surface opening to prevent entrance of foreign matter.

D. Install Refueling Adapter Check Valve.

(1) Make sure inside of adapter and entire check valve assembly are clean.

(2) Preassemble check valve assembly by placing spring over check valve pilot shaft, and then laying check valve inside the flange.

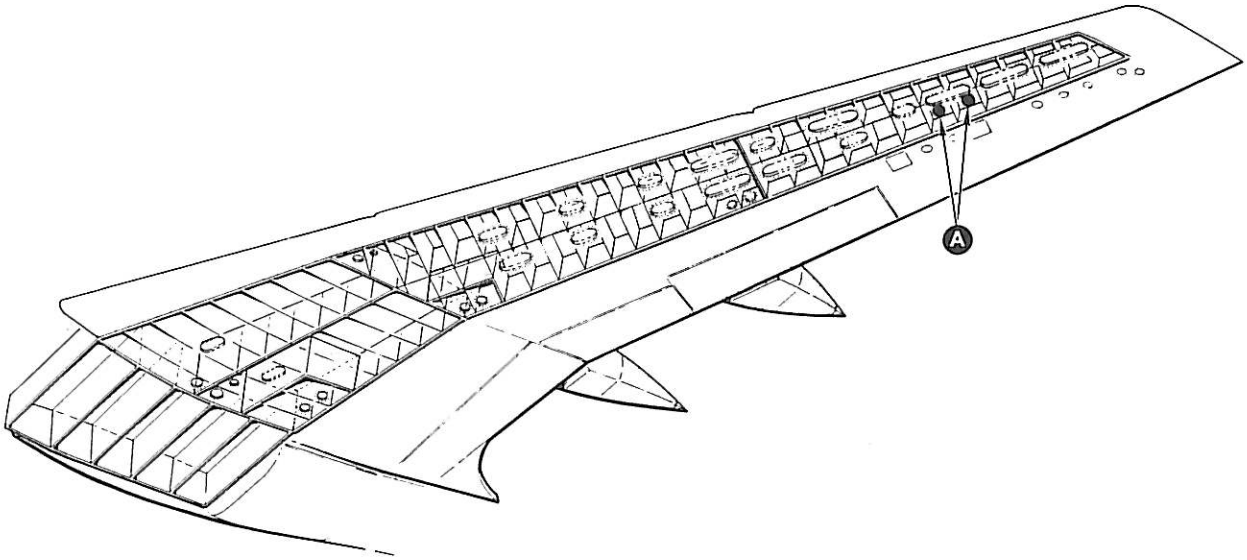
(3) Insert flange and check valve assembly, with a new seal, in adapter housing in wing.

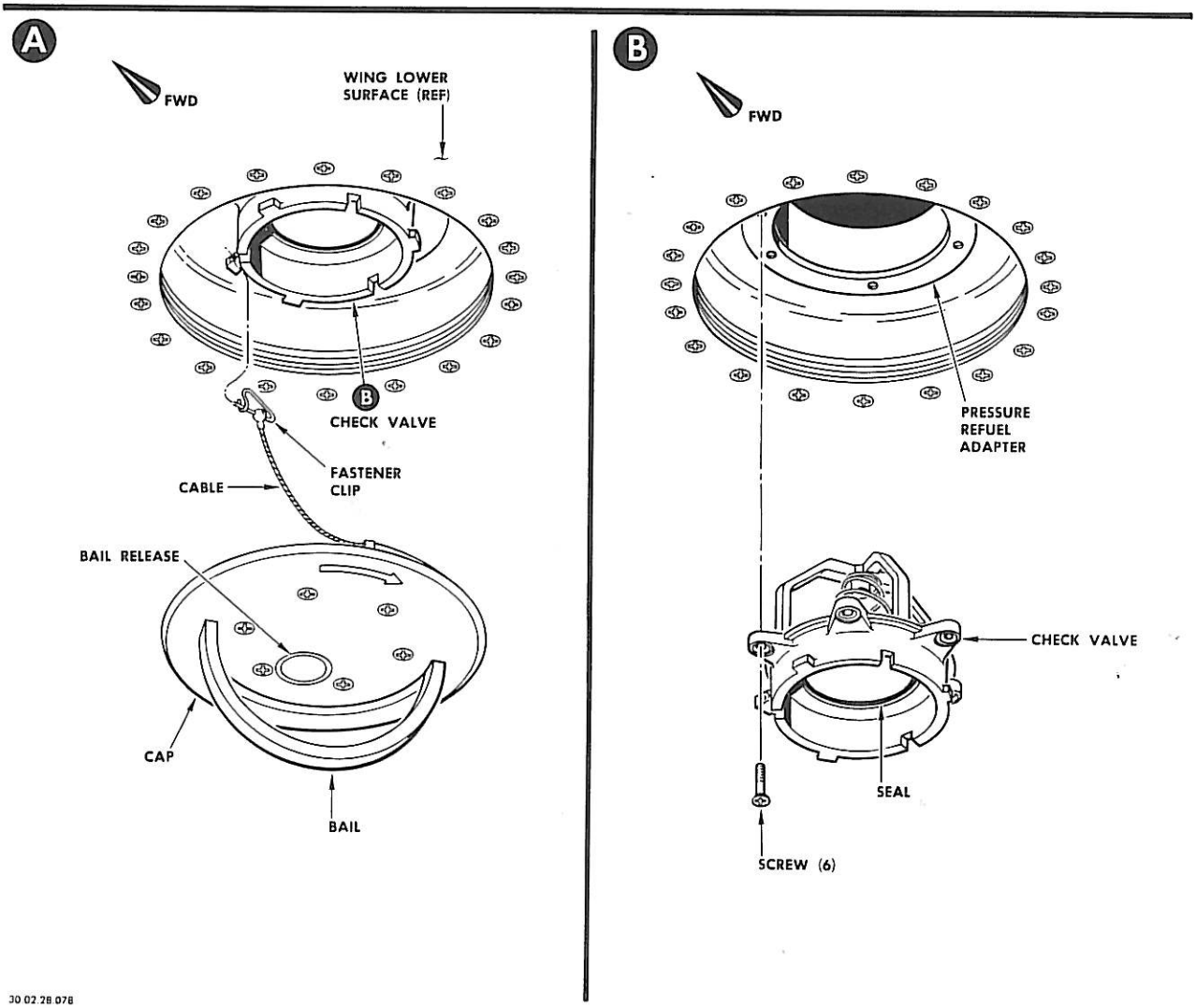
(4) Push flange up against spring tension to a point where the attachment screws can be started.

(5) Align seal, flange, and housing screw holes and install five attachment screws. Attach cap cable to adapter with remaining attachment screw.

(6) Refuel tank; refer to Chapter 12, SERVICING.

(7) Check installation for leakage.


A


A
FWD
WING LOWER SURFACE (REF)
B
CHECK VALVE
FASTENER CLIP
CABLE
BAIL RELEASE
CAP
BAIL
B
FWD
PRESSURE REFUEL ADAPTER
CHECK VALVE
SEAL
SCREW (6)
30 02 28 078

FUEL SUPPLY SYSTEM - DESCRIPTION AND OPERATION

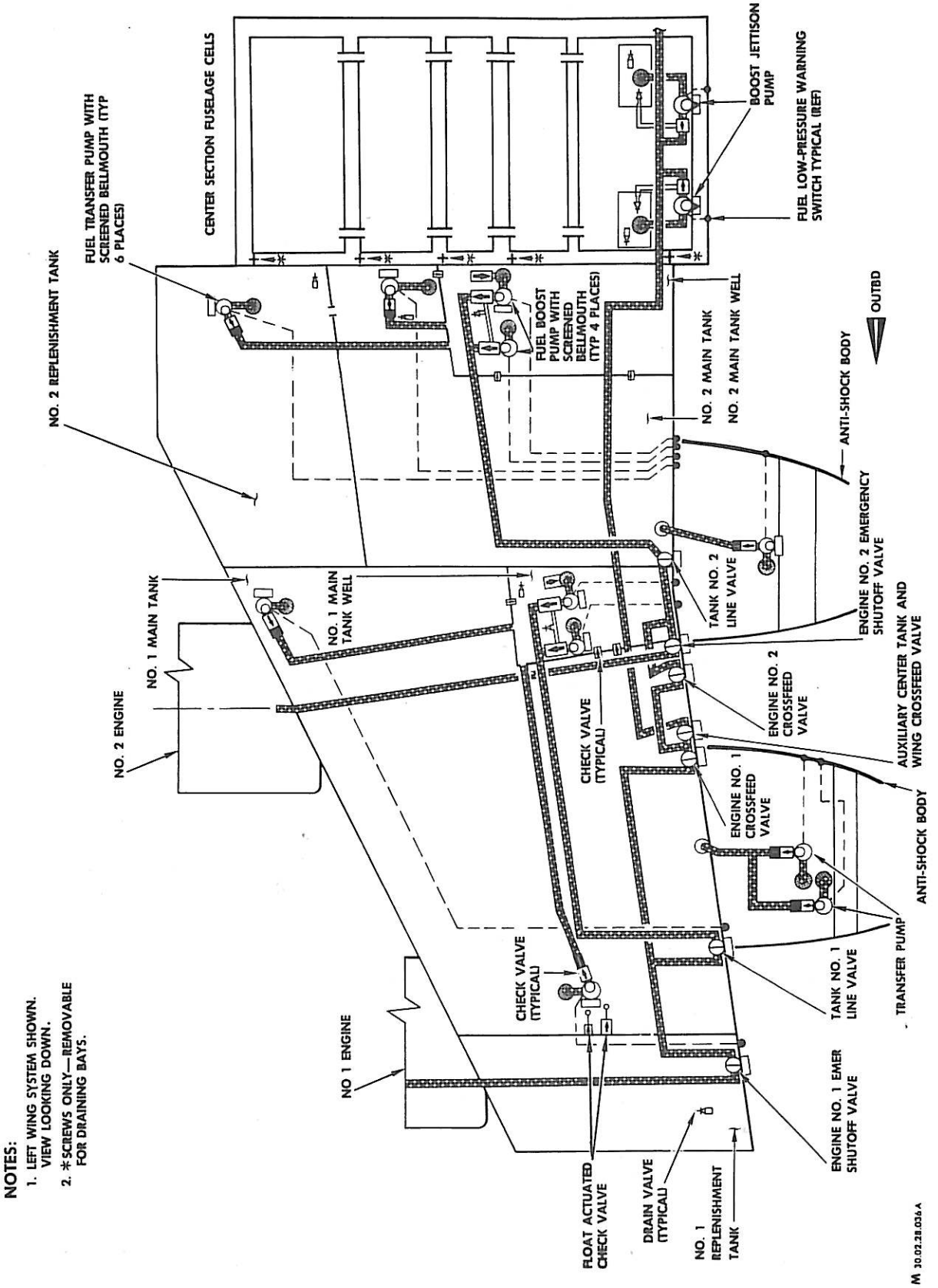
1. General

The four, engine-driven fuel pumps are supplied fuel by the electrically powered dual boost pumps in each main tank well, or by two hydraulically operated boost-jettison pumps in the auxiliary center section tank. Transfer pumps in all main tanks and in the inboard replenishment tanks supply fuel to the tank wells, from which excess fuel spills back into the main tanks. The forward walls of the wells do not allow overflow into the main tanks, thus helping to maintain the fuel level above the boost pumps, housed in the wells, during airplane in-flight nose down attitudes. Fuel from the outboard replenishment tanks transfers by gravity flow to the outboard main tanks through float-check valves located in the interconnecting bulkheads. These valves, in conjunction with openings in the bulkheads of the inboard replenishment tanks and flapper valves in the bulkheads of all wells, maintain proper fuel levels in the entire system; transfer of fuel through the bulkhead valves or openings is sufficient to allow operation if a transfer pump becomes inoperable. Fuel from the ASB tank is transferred to the corresponding tanks by transfer pumps contained within the individual ASB tanks. Fuel is delivered to the engines by the boost-jettison pumps in the center section via the crossfeed system; when one or both jettison valves for the center section is opened, these pumps scavenge the center section tank cells. A schematic of the fuel supply system is shown on Figure 1.

The crossfeed system incorporates a crossfeed valve for each wing tank, and two combination auxiliary center tank and wing (aux ctr tank and wing) crossfeed valves. All of the valves are electrically operated, and allow crossfeeding from any or all tanks to any or all engines.

2. Transfer and Booster Pumps

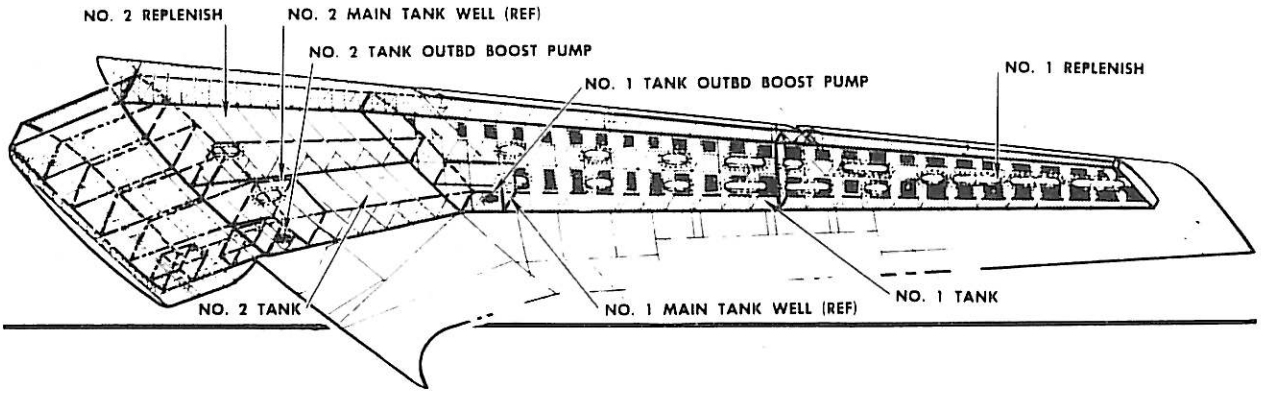
The fuel supply system contains 22 impeller-type pumps -- eight boost and 14 transfer. Two boost pumps are installed in each main tank well; two transfer pumps are in each outboard ASB, one in each inboard ASB, two in each outboard replenishment tank, and one in each inboard main and inboard replenishment tank. The interchangeable boost and transfer pumps, installed in fuel-tight housings in the bottom of the tanks, may be replaced without draining the tanks. Each pump housing incorporates a spring-loaded flapper valve which helps to seal the pump housing from the tank for pump replacement. During operation, the flapper valve is opened by force of the coolant fuel flowing through the valve into the fuel tank; vapors forming in the coolant chamber vent into the tank through this valve. A non-resetting electrical thermal switch that actuates at 362 (±15) degrees F is installed in the top of the pump motor case; if the motor overheats, the switch actuates to shut it off. The pump must be replaced if it is shut off by the thermal switch. The fuel boost pump electrical circuit is shown on Figure 2 and the transfer pump circuit is shown on Figure 3. A typical pump and housing is illustrated on 28-3-1, Figure 201. All pumps are operated by 115/200-volt, 3-phase, ac electrical power (each phase operating on 115 volts), and are activated by switches on the flight engineer's fuel control

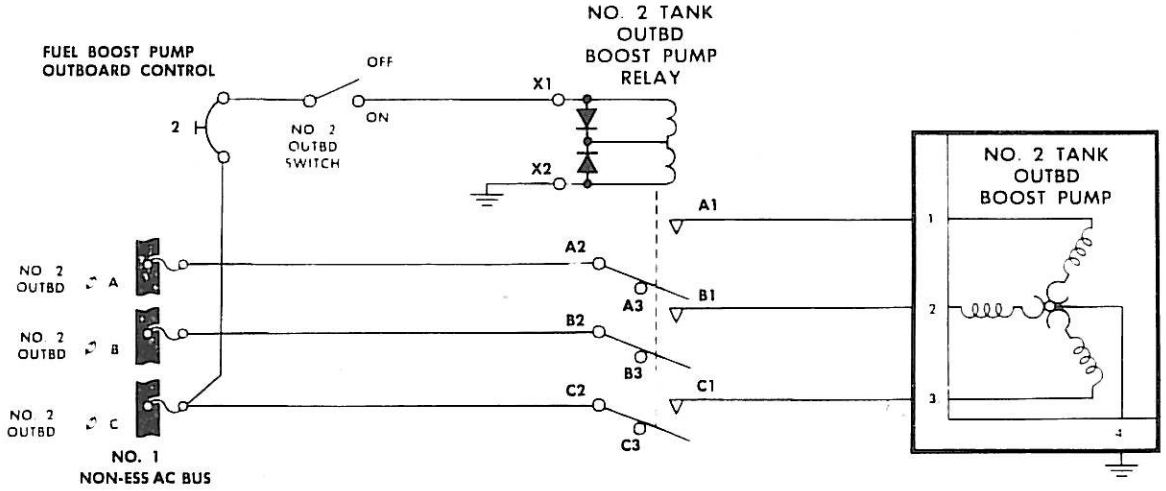


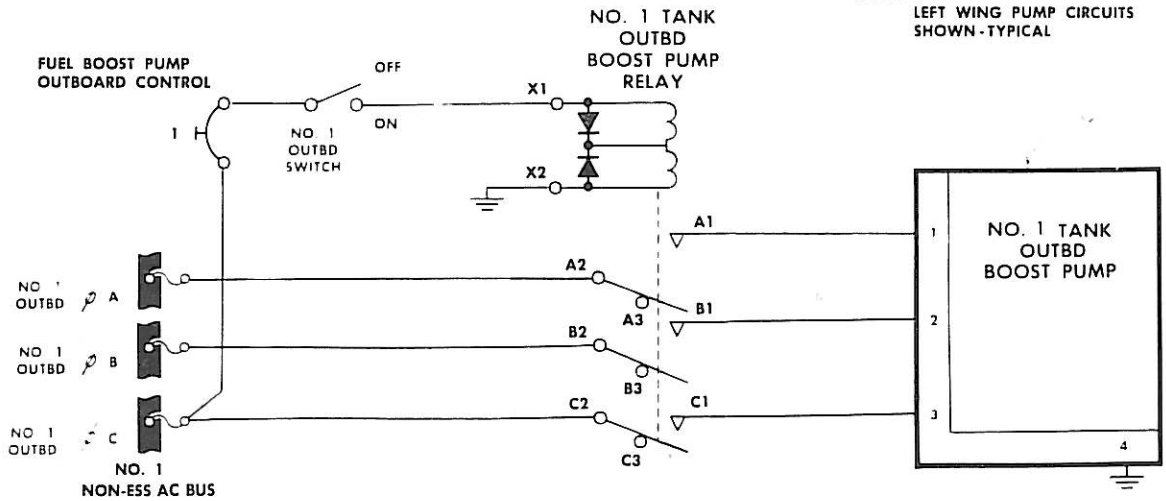
NOTES:

1. LEFT WING SYSTEM SHOWN. VIEW LOOKING DOWN.
2. * SCREWS ONLY — REMOVABLE FOR DRAINING BAYS.

Fuel Supply System Schematic
Figure 1







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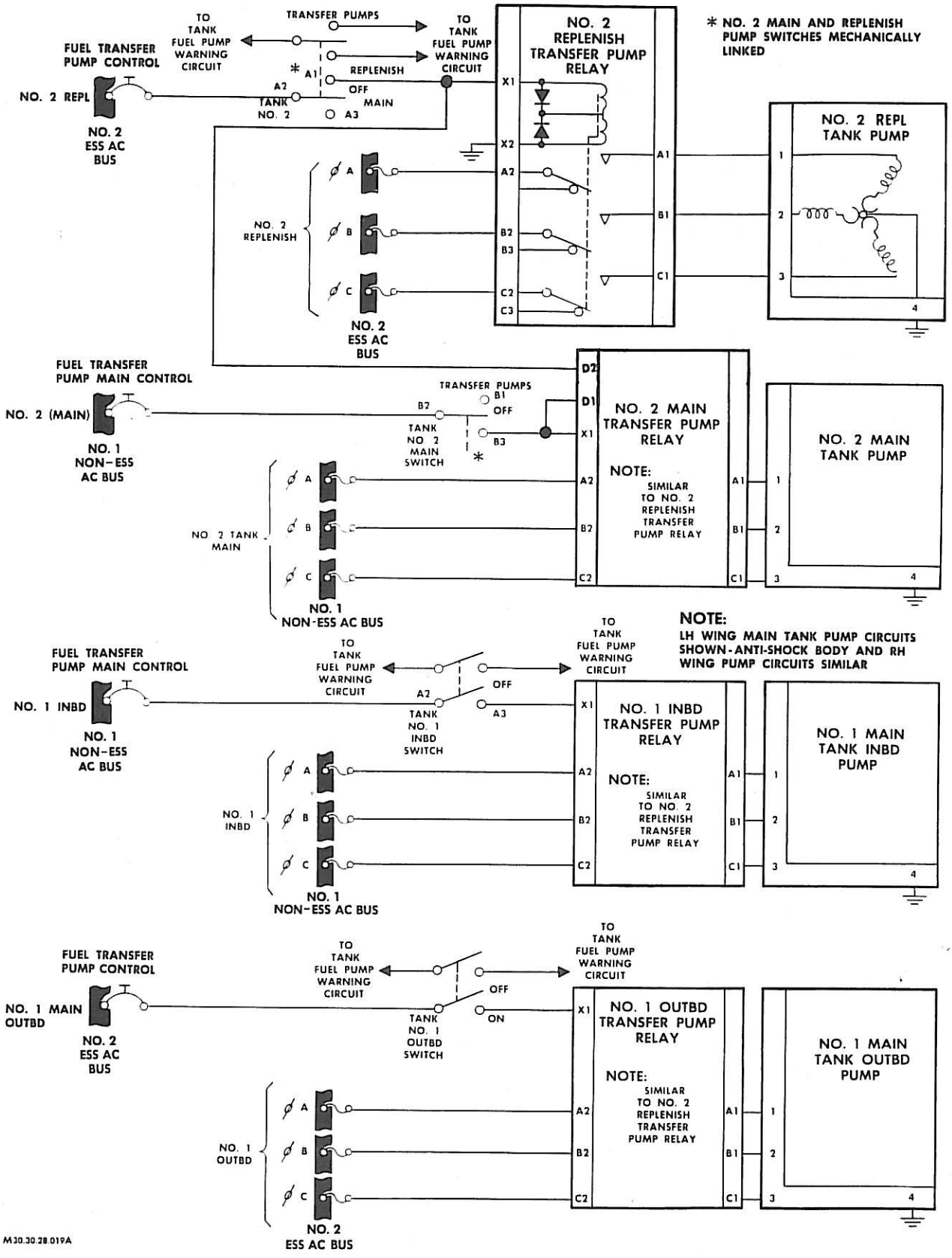

TO TANK FUEL PUMP WARNING CIRCUIT
TRANSFER PUMPS
TO TANK FUEL PUMP WARNING CIRCUIT
FUEL TRANSFER PUMP CONTROL
NO. 2 REPL
* A1
A2
TANK NO. 2
A3
REPLENISH
OFF
MAIN
NO. 2 ESS AC BUS
NO. 2 REPLENISH TRANSFER PUMP RELAY
* NO. 2 MAIN AND REPLENISH PUMP SWITCHES MECHANICALLY LINKED
NO. 2 REPL TANK PUMP
NO. 2 REPLENISH
NO. 2 ESS AC BUS
FUEL TRANSFER PUMP MAIN CONTROL
NO. 2 (MAIN)
NO. 1 NON-ESS AC BUS
TRANSFER PUMPS
TANK NO 2 MAIN SWITCH
NO. 2 MAIN TRANSFER PUMP RELAY
NOTE: SIMILAR TO NO. 2 REPLENISH TRANSFER PUMP RELAY
NO. 2 MAIN TANK PUMP
NO. 2 TANK MAIN
NO. 1 NON-ESS AC BUS
NOTE: LH WING MAIN TANK PUMP CIRCUITS SHOWN-ANTI-SHOCK BODY AND RH WING PUMP CIRCUITS SIMILAR
FUEL TRANSFER PUMP MAIN CONTROL
NO. 1 INBD
NO. 1 NON-ESS AC BUS
TANK NO. 1 INBD SWITCH
NO. 1 INBD TRANSFER PUMP RELAY
NOTE: SIMILAR TO NO. 2 REPLENISH TRANSFER PUMP RELAY
NO. 1 MAIN TANK INBD PUMP
NO. 1 INBD
NO. 1 NON-ESS AC BUS
FUEL TRANSFER PUMP CONTROL
NO. 1 MAIN OUTBD
NO. 2 ESS AC BUS
TANK NO. 1 OUTBD SWITCH
NO. 1 OUTBD TRANSFER PUMP RELAY
NOTE: SIMILAR TO NO. 2 REPLENISH TRANSFER PUMP RELAY
NO. 1 MAIN TANK OUTBD PUMP
NO. 1 OUTBD
NO. 2 ESS AC BUS
M30.30.28.019A

panel. The No. 2 and No. 3 tank system transfer pumps are controlled by single-pole, double-throw switches for selection of NO. 2 or NO. 3 REPLENISH on one throw, and NO. 2 or NO. 3 MAIN on the other throw. However, a jumper wire between the input power sides of the two pump power relay coils routes through a set of normally-open contacts in the main pump power relay; consequently whenever the No. 2 or No. 3 transfer pump switch is placed in MAIN position, both main and replenish pumps operate. The pump power control relay coil circuits are protected by circuit breakers, and each 3-phase ac power leg for each pump is protected by a fuse. Power for related pump operation and relay control is obtained from the same ac bus.

The fuel boost pumps have low-pressure warning switches associated with corresponding red warning lights. The fuel transfer pumps in the outboard main tanks have low-pressure warning switches associated with corresponding amber warning lights; the transfer pumps in the inboard main and in the inboard replenishment tanks are served by one amber warning light for each wing (two lights serving four pumps). The boost and transfer pump warning lights are located on the flight engineer's fuel control panel, directly above their corresponding control switches.

A sleeve valve at the pump housing inlet is manually closed to prevent fuel flow from the inlet side of the housing when a pump is replaced; a check valve in the outlet line and the flapper valve on the housing also prevent fuel loss during pump replacement. All pump inlet bellmouths are protected with 8-mesh strainer screens. A check valve in the bellmouth of the inboard boost pump in each tank will bypass fuel if the bellmouth screen becomes clogged.

Two boost-jettison pumps, one in the right and one in the left sump of the center section tank aft cell, are hydraulically driven and electrically controlled; refer to 28-5-0.

3. Fuel Temperature Sensing

A single fuel temperature gage installed to the right of the flight engineer's fuel control panel, a sensing bulb in No. 1 tank well and a sensing bulb in each fuel line downstream from the engine mounted fuel heaters are associated with the fuel supply system. During extreme cold, especially at altitude, the flight engineer can check the gage to determine if fuel temperatures are approaching the freezing point. A selector switch located below the fuel temperature gage is used to select the different areas. Refer to Chapter 77, ENGINE INDICATING, for a schematic of the fuel temperature indicating system.

4. Low-Pressure Warning Switches

There is one low-pressure warning switch for each transfer pump, boost pump and boost-jettison pump in the system. The switches, located on the rear spar of each wing, are connected to the discharge side of the pumps by pressure-sensing lines. When fuel pressure flow is low, or lost, the lack of pressure to the switch diaphragm causes the switch to close the electrical circuit to ground, thereby illuminating the corresponding pump low-pressure warning light on the flight engineer's fuel control panel. The

fuel low-pressure warning electrical circuit is shown on Figure 4. See 28-3-2, Figure 201, for an illustration of the switches.

5. Fuel Line Shutoff Valves

Two fuel shutoff valves on the rear spar of each wing, within the tanks, incorporate a thermal relief and are operated by electrical dc power from the 28-volt dc emergency bus. The valves electrically transmit an in-transit signal to the corresponding indicator light on the flight engineer's fuel control panel. The fuel line shutoff valve circuit is shown on Figure 5.

6. Fuel Crossfeed Valves and Auxiliary Center Tank and Wing Crossfeed Valves

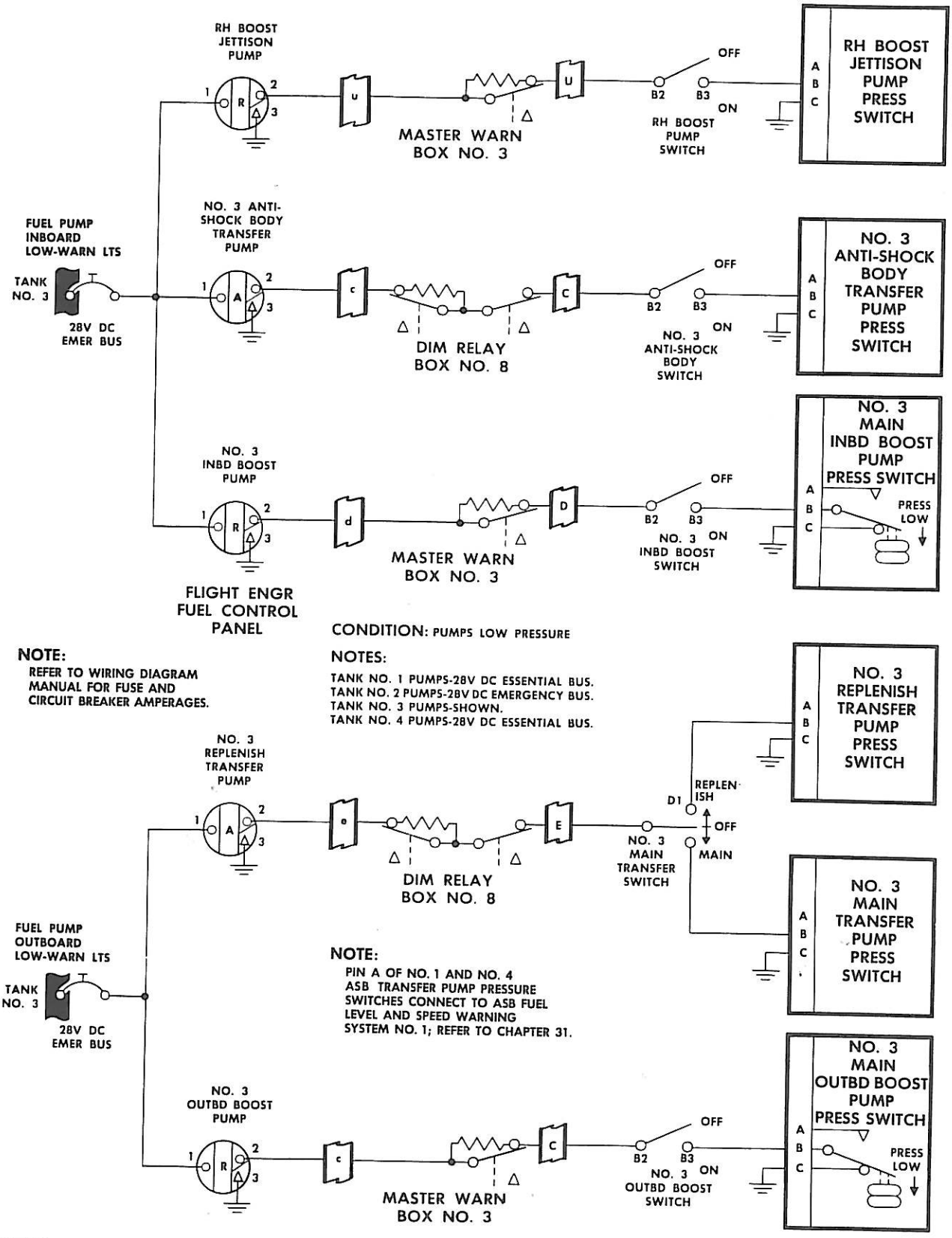
There are two crossfeed valves and one combination auxiliary center tank and wing (aux ctr tank and wing) crossfeed valve in each wing, all mounted on the rear spar, within the tanks. The crossfeed valves allow flow of fuel from an outboard tank to an inboard engine, or from an inboard tank to an outboard engine, on the same wing; the aux ctr tank and wing crossfeed valves are used in conjunction with the crossfeed valves to provide fuel flow from the tank(s) in one wing to the engine(s) on the other wing, or to route fuel from the center section boost-jettison pumps to the engines. All of the crossfeed system valves are powered from the 28-volt dc emergency bus, and all electrically transmit an in-transit signal to a corresponding blue indicator light on the flight engineer's fuel control panel. The valves incorporate a thermal relief switch. The electrical circuits for the crossfeed system valves are shown on Figures 6 and 7.

7. Fuel Emergency Shutoff Valves

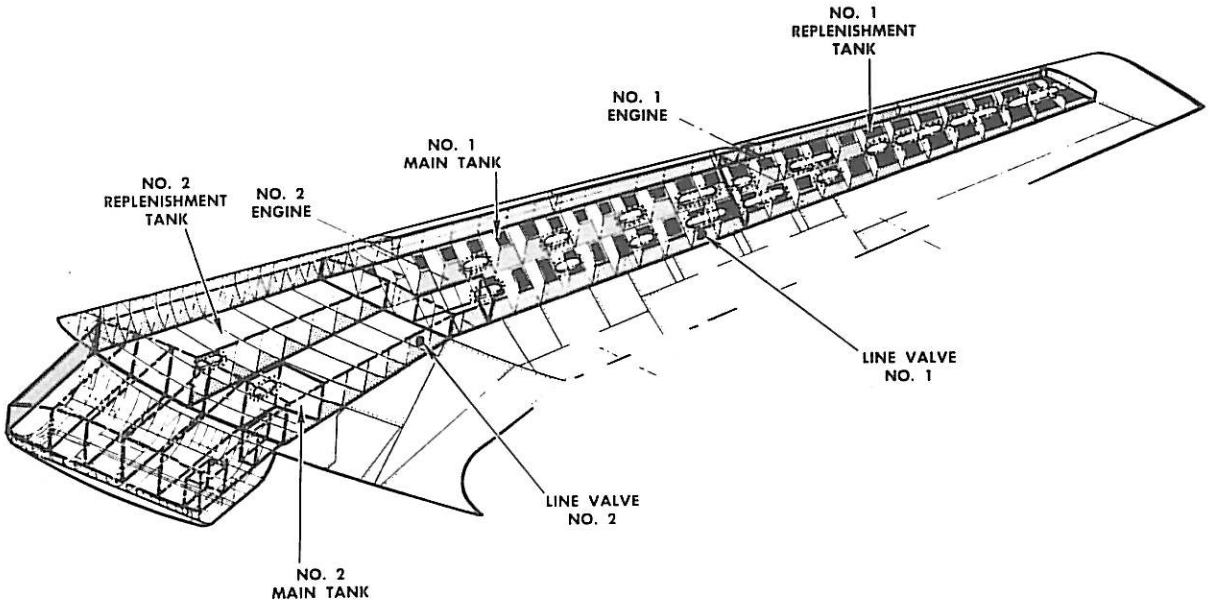
One fuel emergency shutoff valve for each engine is located on the rear spar. The valves are operated by power from the 28-volt dc emergency bus, and transmit an electrical signal to indicate the valve-closed position. A green indicator light on the flight engineer's fuel control panel illuminates when the valve is in the closed position and is extinguished when the valve is in its normal, open position. The valves are operated by a corresponding FIRE PULL handle on the fire protection system fire control panel, since their primary function is to close off fluid to the engines in case of fire; operating a FIRE PULL handle causes the corresponding emergency shutoff valve to close; refer to Chapter 26, FIRE PROTECTION. The electrical circuit for the valves is shown on Figure 8.

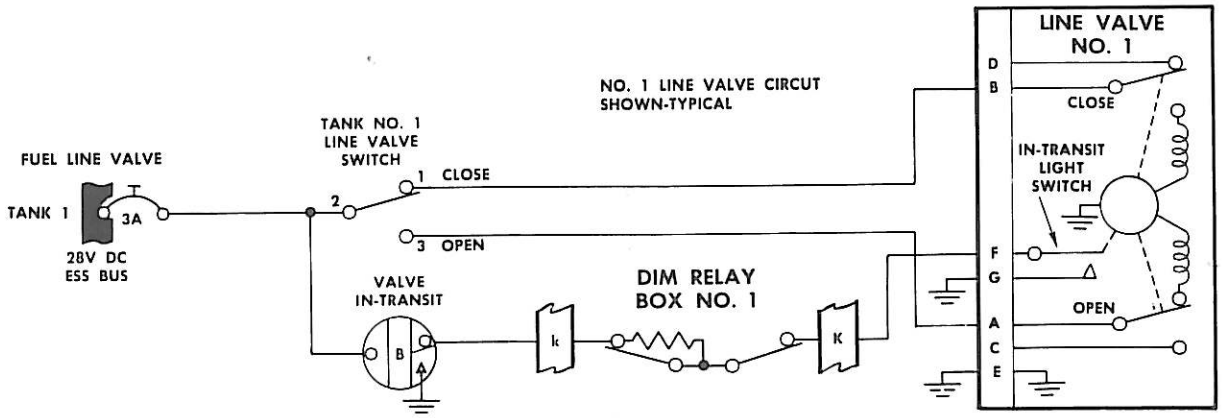
8. Fuel Line Check Valves and Restrictors

A flapper-type check valve is installed in the line at the discharge side of each transfer boost, and boost-jettison pump. These valves, attached directly to the pump housings, prevent loss of fuel when a pump is removed, and also prevent backpressure fuel from entering an inoperative pump through the parallel connections. Line restrictors to meter fuel flow are down-stream from each transfer pump check valve, except in the out-board ASB's. See 28-3-6, Figure 201, for view of a typical check valve.



Fuel Low-Pressure Warning Circuit
Left Outboard Tank, Typical
Figure 4





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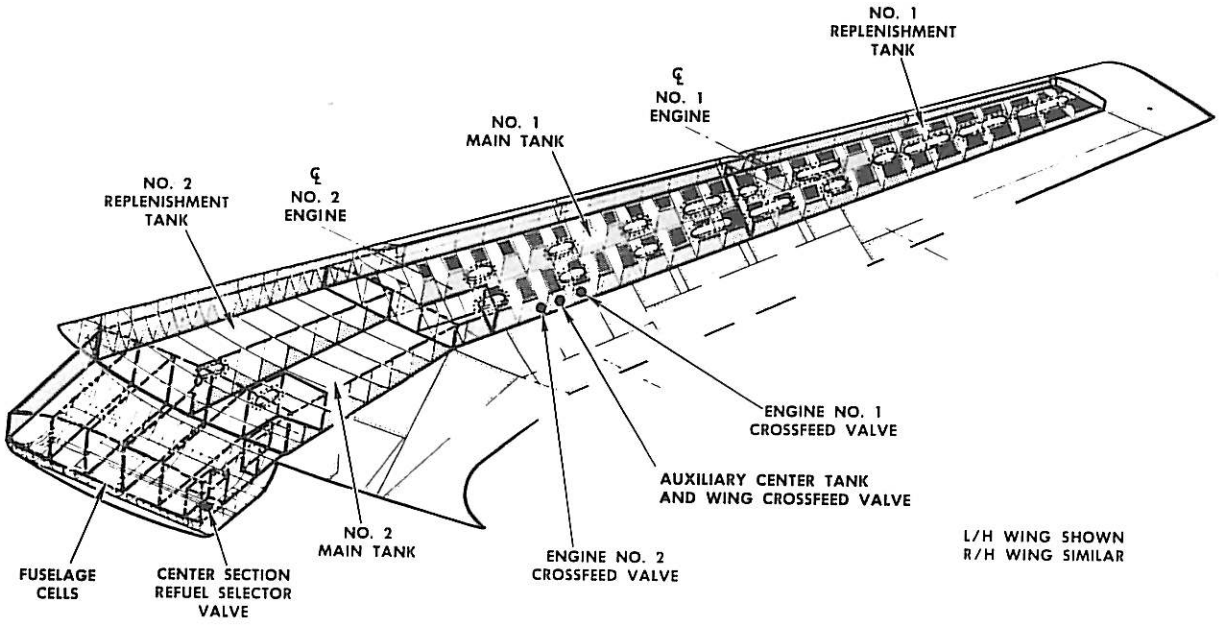
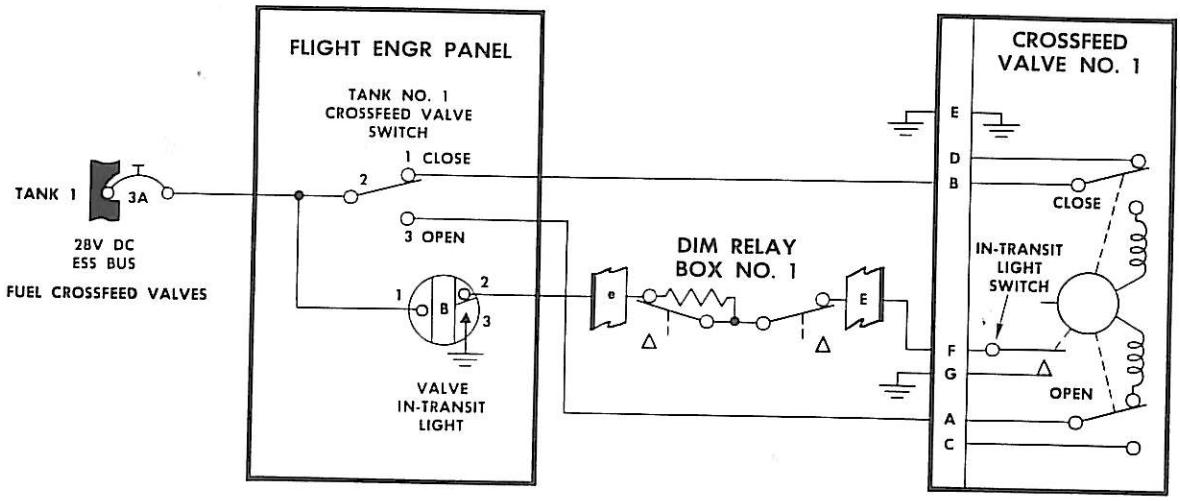
Fuel Tank Line Valves Electrical Circuit
Figure 5

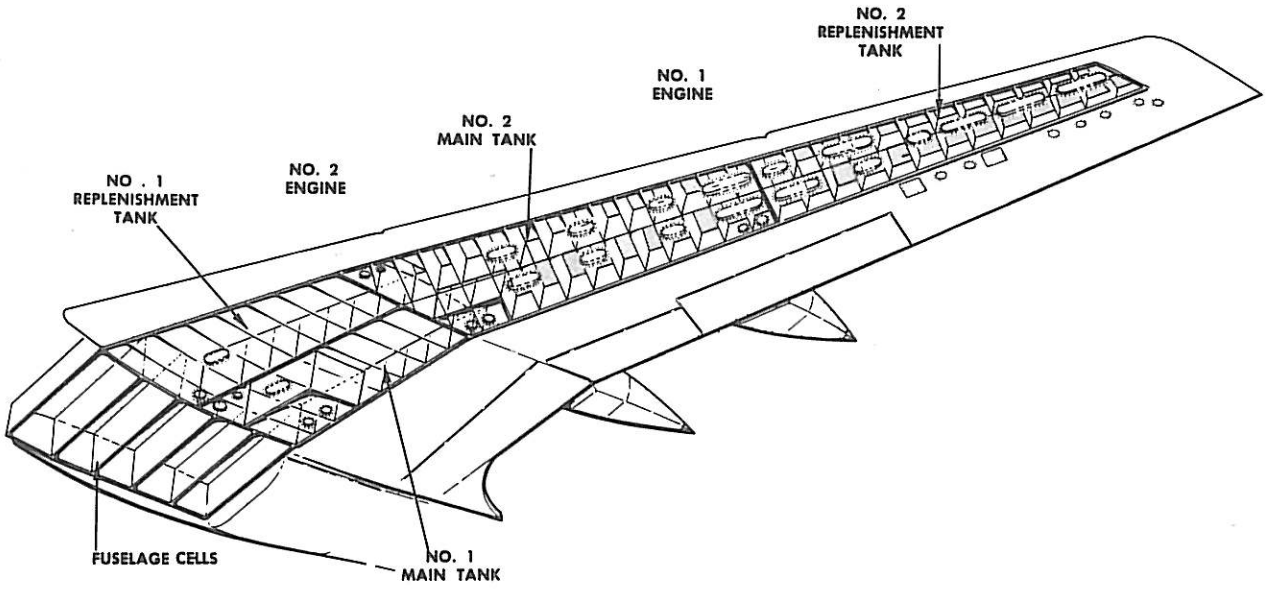




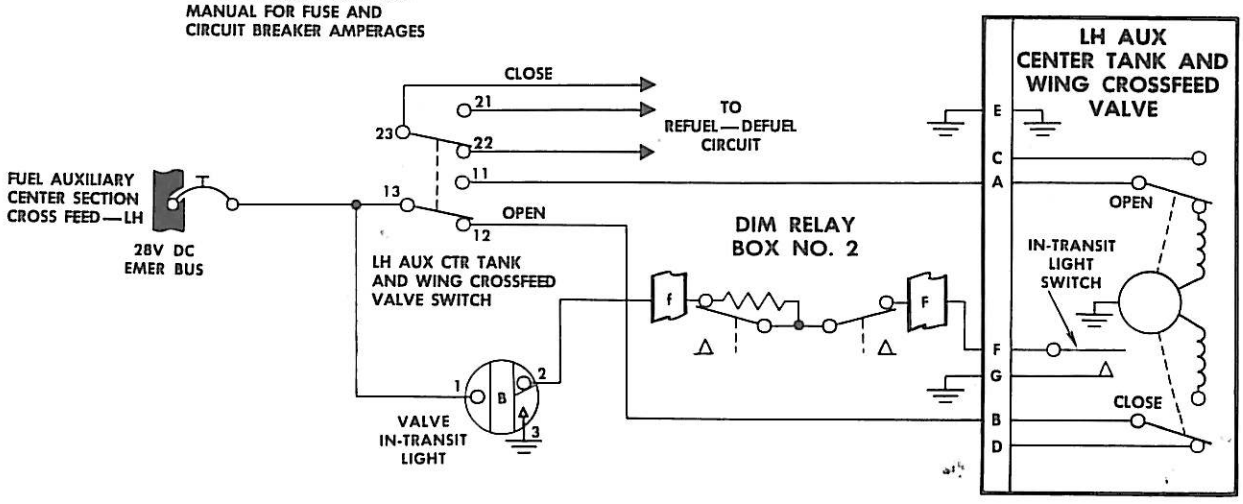
NOTE:
TANK NO. 1 CROSSFEED VALVE CIRCUIT SHOWN. TANK NO. 2, 3, & 4 CROSSFEED VALVE CIRCUITS SIMILAR.

CONDITION:
VALVE SHOWN IN CLOSED POSITION.

30.30.28.023A



NOTE:
REFER TO WIRING DIAGRAM MANUAL FOR FUSE AND CIRCUIT BREAKER AMPERAGES

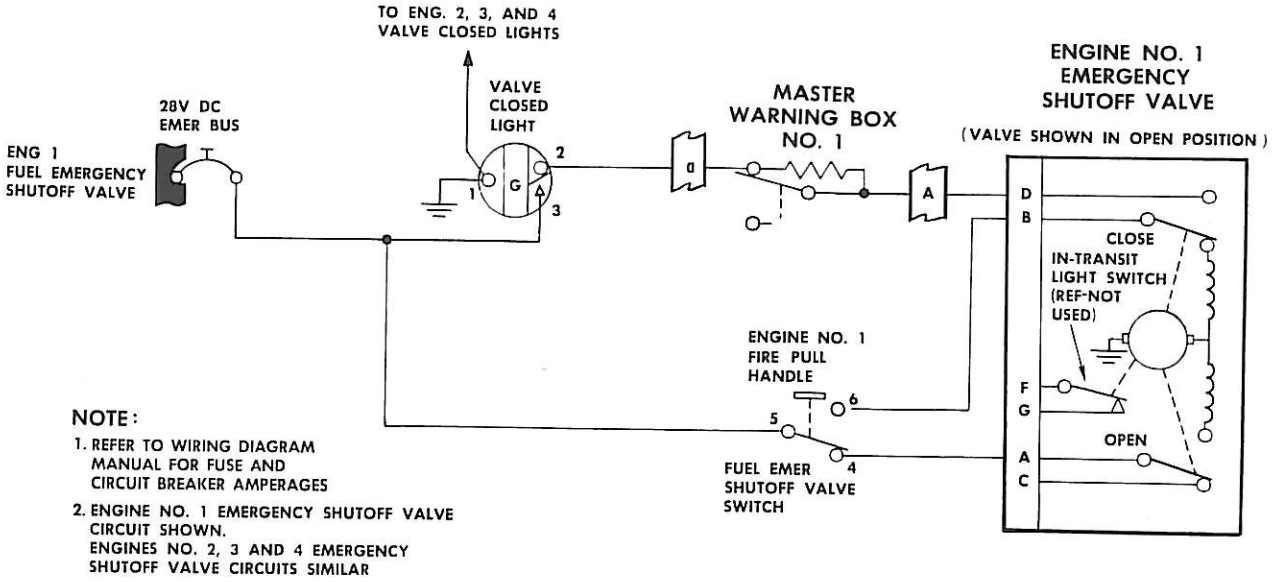


CONDITION:
VALVE SHOWN IN OPEN POSITION

NOTES:
LH AUX CTR TANK AND WING CROSSFEED VALVE CIRCUIT SHOWN.
RH AUX CTR TANK AND WING CROSSFEED VALVE SIMILAR.

30.30.28.024B

Center Tank/Wing Crossfeed
Valves Electrical Circuit
Figure 7


TO ENG. 2, 3, AND 4 VALVE CLOSED LIGHTS
VALVE CLOSED LIGHT
28V DC EMER BUS
ENG 1 FUEL EMERGENCY SHUTOFF VALVE
MASTER WARNING BOX NO. 1
ENGINE NO. 1 EMERGENCY SHUTOFF VALVE
(VALVE SHOWN IN OPEN POSITION)
CLOSE IN-TRANSIT LIGHT SWITCH (REF-NOT USED)
OPEN
ENGINE NO. 1 FIRE PULL HANDLE
FUEL EMER SHUTOFF VALVE SWITCH
NOTE:
1. REFER TO WIRING DIAGRAM MANUAL FOR FUSE AND CIRCUIT BREAKER AMPERAGES
2. ENGINE NO. 1 EMERGENCY SHUTOFF VALVE CIRCUIT SHOWN. ENGINES NO. 2, 3 AND 4 EMERGENCY SHUTOFF VALVE CIRCUITS SIMILAR

30 30 28 025C

9. Drain Valves

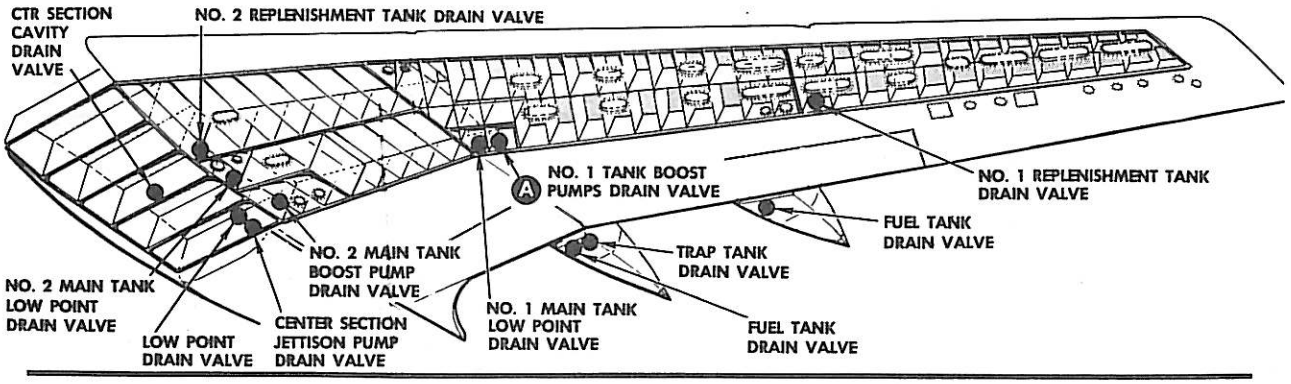
Fuel traps and low points in the wing ASB, and center section areas are drained through push-type drain valves mounted flush in the lower surfaces. There are a total of 23 valves of this type: 16 tank low point drains (one each in the main, replenishment, anti-shock body fuel and inboard anti-shock body trap compartments, two in the center section cells, and one in the center section cell cavity), and six fuel supply system low point drains. Five quarter-inch drain screws along the left side of the center section cavity drain moisture from the area. The presence of fuel at these screw holes indicates leakage from the fuel cells or from integral fuel tanks No. 2 or No. 3. The valves drain by gravity when opened, draining water and/or residual fuel. To operate a drain valve, a special tool incorporating a plastic bottle is inserted into a center slot in the valve's primary poppet and pushed upward. Turning the tool 90 degrees then locks the valve in the open position and holds the tool attached to the valve, and the fluid drains into the bottle. The drain valves may also be operated with a slot type screwdriver. The six low point drain lines leading from the boost pump outlets to the corresponding drain valves are steel-mesh-covered Teflon hoses. The tank low point drains have a siphon tube which drains all water and residual fuel; water should be drained in preflight checks and before refueling. A typical drain valve and locations of the valves are shown on Figure 9.

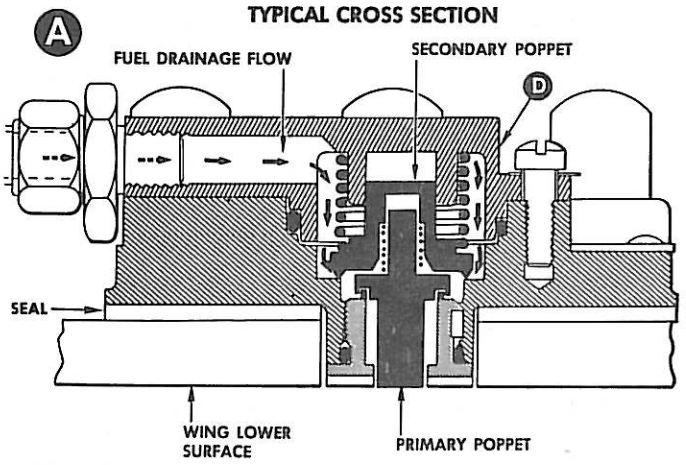
10. Float-Actuated Check Valves

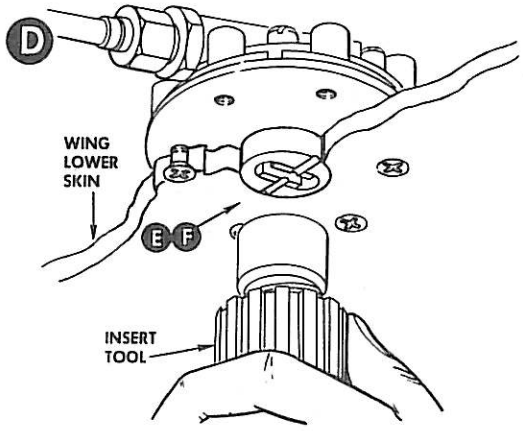
Float-actuated check valves are used to control fuel distribution. One three-inch check valve, and one three-eighths-inch check valve is located at the low point on the bulkhead between the outboard replenishment and main fuel tanks. The floats close the valves to prevent flow of fuel from a main tank to a replenishment tank. When the fuel level in a replenishment tank is four inches higher than in a main tank, the head pressure of the fuel in the replenishment tank overrides the floats and allows fuel flow into the main tank until the pressure is equalized; residual fuel flows through the open valves when the floats are no longer buoyed up by fuel in the main tank. Fuel between the trap tank and fuel storage of the inboard anti-shock bodies is controlled by a three-eighths-inch check valve. A typical float-actuated check valve is shown on 28-3-8, Figure 201.

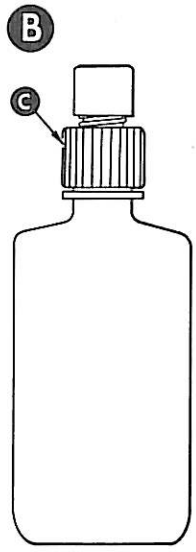
11. Flapper-Type Check Valves, Tank Wells

Three flapper-type check valves are installed in the bulkheads of each main tank well. Two of the valves are in the outboard bulkheads of each well and one is in the forward bulkhead of each well. The valve flappers prevent flow of fuel from the wells, and allow flow of fuel into the wells. Normally, when transfer pumps are supplying fuel to a well, the fuel level in the well is as high, or higher, than the level in its corresponding main tank; excess fuel in a well spills over the top and back into the main tank. When fuel levels are low in the main tanks, and still lower in the wells, residual fuel in the main tanks flows through the check valves into the wells. See 28-3-9, Figure 201, for view of a flapper-type check valve.

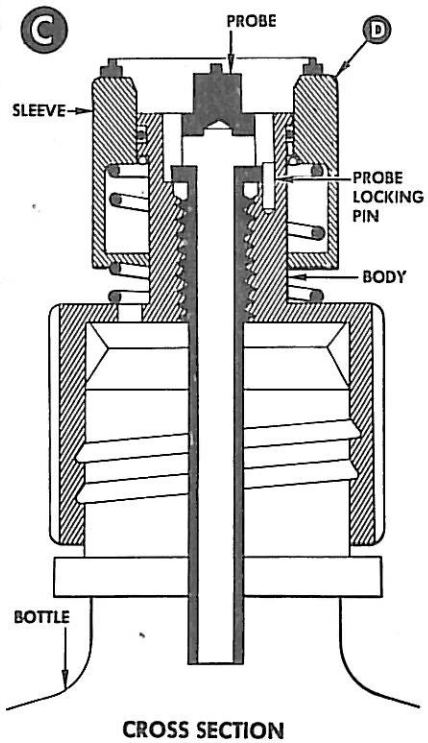




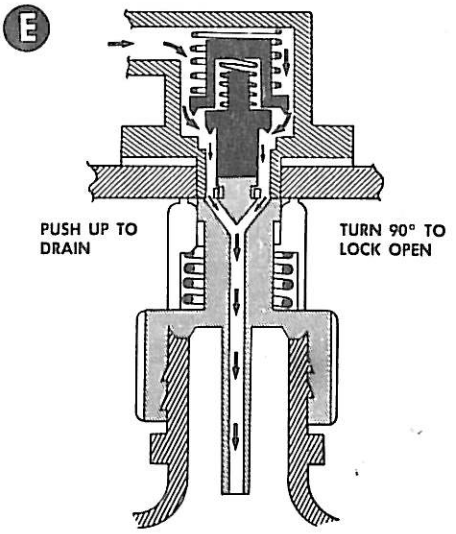


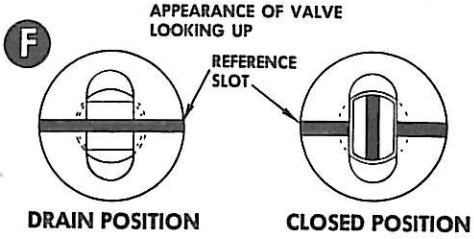


PLASTIC DRAIN BOTTLE WITH TOOL #704400 ACCESSORY PRODUCTS CO.



CROSS SECTION





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12. Boost Pump Intake Check Valves

A check valve is incorporated in the bellmouth of the inboard boost pump in each tank. These valves will bypass fuel if the associated bellmouth screen becomes clogged.

13. ASB Excess Fuel and Speed Warning Systems

The outboard anti-shock bodies incorporate two separate fuel level and speed warning circuits - System No. 1 and System No. 2. For ***Group I airplanes, System No. 1 rings a bell intermittently if airplane speed exceeds *785, **718 mach or *357, **321 knots IAS while there is fuel in the outboard ASB tanks. When the outboard ASB transfer pumps lose pressure due to lack of fuel, the bell circuit opens. For ***Group II airplanes, System No. 1 rings a bell if the airplane exceeds the noted speed and either outboard ASB tank has more than 35 gallons of fuel. With more than 35 gallons of fuel in either ASB, the system also illuminates the pilot's MASTER WARN light and the OASB PUMP OFF light on the flight engineer's panel if the outboard pump in the ASB is not operating. In System No. 2, an independent bell will ring intermittently if airplane exceeds noted speed when there is more than 40 gallons of fuel in either outboard ASB tank. The system will also illuminate an amber EXCESS FUEL light on the flight engineer's panel, regardless of airplane speed, when there is more than 40 gallons of fuel in either outboard ASB. The No. 2 System utilizes the bell of the Velocity Maximum Operation/Mach Maximum Operation(VMO/MMO) warning system. Refer to Chapter 31, INSTRUMENTS for complete details of the warning systems. Replacement of the ASB fuel level float switch(es) is contained in this chapter.

* Applicable to airplanes CV1, CV2, and CV5 through CV24.
** Applicable to airplanes CV3, CV4, CV25 and on.
*** Refer to Manual Introduction for Explanation of Group Designations.

FUEL SUPPLY SYSTEM - TROUBLE SHOOTING

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
1. FUEL BOOST OR TRANSFER PUMP LOW-PRESSURE WARNING LIGHT ILLUMINATED	
A. Pump stopped due to:	Place pump control switch in ON position and listen at wing for pump actuation. If pump actuates, trouble is in area other than noted. If pump does not actuate:
(1) Open indicating limiters in 3-phase power circuit to pump.	(1) Check for presence of power through power circuit limiters. If no power, replace limiter.
(2) Defective pump control relay	(2) Plug in substitute relay, installing one screw for good ground, and check for pump operation. If pump operates, permanently install substitute relay.
(3) Defective circuit breaker pump control circuit.	(3) Check for presence of power through circuit breaker. If no power replace circuit breaker.
(4) Defective wiring in pump control circuit.	(4) Check for continuity through control circuit from circuit breaker to switch, from switch to relay, and from relay to ground. Repair or replace wiring as required.
(5) Defective wiring in pump power circuit.	(5) Check for continuity through power circuit from limiters to relay socket. Remove pump for access to pump plug and check for continuity from pump plug to relay socket. If no continuity, repair or replace wiring, or replace relay socket.
(6) Thermal switch in pump open due to pump overheating	(6) Replace pump.
B. Low-pressure switch wiring shorted to ground between light and switch.	(1) Unplug dimming relay of light circuit. If light is still illuminated, short is between light and relay. Repair wiring as required.
	(2) Disconnect plug from low-pressure switch. If light is still illuminated, short is between dimming relay and low-pressure switch. Repair wiring as required.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
1. FUEL BOOST OR TRANSFER PUMP LOW-PRESSURE WARNING LIGHT ILLUMINATED (CONT)	
C. Defective low-pressure warning switch.	Replace low-pressure warning switch.
2. LOW-PRESSURE WARNING LIGHT DOES NOT ILLUMINATE MOMENTARILY WHEN BOOST OR TRANSFER PUMP SWITCH PLACED IN "ON" POSITION ("PRESS-TO-TEST" FEATURE ILLUMINATES LIGHT)	
A. Defective dimming relay.	Refer to Chapter 31, INSTRUMENTS for trouble.
B. Defective pump control relay	Plug in substitute relay and check for light illumination when pump is started. If light illuminates, permanently install substitute relay.
C. Defective wiring between light and switch; switch to ground.	Check for continuity through wiring. If no continuity, repair or replace wiring.
D. Defective low-pressure warning switch.	Replace switch.
3. LOW-PRESSURE WARNING LIGHT DOES NOT ILLUMINATE MOMENTARILY WHEN ANY BOOST OR TRANSFER PUMP SWITCH PLACED IN "ON" POSITION ("PRESS-TO-TEST" FEATURE DOES NOT ILLUMINATE LIGHT)	
A. Defective circuit breaker in light circuit	Check for presence of power through circuit breaker. If no power, replace circuit breaker.
B. Defective light bulb.	Check press-to-test feature with new light bulb.
C. Defective wiring between light socket and circuit breaker.	Check for continuity through wiring. If no continuity, repair or replace wiring.
4. TANK NO. 1 OUTBOARD BOOST PUMP, INBOARD TRANSFER PUMP; TANK NO. 2 OUTBOARD BOOST PUMP, MAIN TRANSFER PUMP; NO. 2 ANTI-SHOCK BODY TRANSFER PUMP, NO. 1 ANTI-SHOCK BODY OUTBOARD TRANSFER PUMP NOT OPERATING	
A. No power in No. 1 nonessential ac bus.	Check for power in bus. If no power refer to Chapter 24, ELECTRICAL POWER for source of trouble.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CURRECTION
5. TANK NO. 1 INBOARD BOOST PUMP, OUTBOARD TRANSFER PUMP; TANK NO. 2 INBOARD BOOST PUMP, REPLENISHMENT TRANSFER PUMP; NO. 1 ANTI-SHOCK BODY INBOARD TRANSFER PUMP NOT OPERATING	
A. No power in No. 2 essential ac bus.	Check for power in bus. If no power refer to Chapter 24, ELECTRICAL POWER for source of power.
6. TANK NO. 3 INBOARD BOOST PUMP, REPLENISHMENT TRANSFER PUMP; TANK NO. 4 INBOARD BOOST PUMP, MAIN TRANSFER PUMP; NO. 4 ANTI-SHOCK BODY INBOARD TRANSFER PUMP NOT OPERATING	
A. No power in No. 3 essential ac bus.	Check for power in bus. If no power, refer to Chapter 24, ELECTRICAL POWER for source of trouble.
7. TANK NO. 3 OUTBOARD BOOST PUMP, MAIN TANK TRANSFER PUMP; TANK NO. 4 OUTBOARD BOOST PUMP, MAIN TANK INBOARD TRANSFER PUMP; NO. 3 ANTI-SHOCK BODY TRANSFER PUMP, NO. 4 ANTI-SHOCK BODY OUTBOARD TRANSFER PUMP NOT OPERATING	
A. No power in No. 4 nonessential ac bus.	Check for power in bus. If no power, refer to Chapter 24, ELECTRICAL POWER for source of trouble.
8. LINE VALVES, CROSSFEED VALVES AND CENTER TANK AND WING CROSSFEED VALVES (ALL) WILL NOT OPERATE TO CLOSED OR OPEN POSITION	
A. No power in 28-volt dc emergency bus.	Check for power in bus. If no power, refer to Chapter 24, ELECTRICAL POWER for source of trouble.
9. INBOARD TANK NOT EMPTYING FAST ENOUGH DURING INBOARD TANK TO OUTBOARD ENGINE CROSSFEED OPERATION	
A. Defuel valve open or defective, allowing fuel from inboard tank to recirculate through inboard refuel shutoff valve.	Check defuel valve; refer to 28-2-0 Trouble Shooting.
10. INBOARD TANK FILLING DURING OUTBOARD TANK TO INBOARD ENGINE CROSSFEED OPERATION	
A. Defuel valve open or defective, allowing fuel from outboard tank to circulate through inboard refuel shutoff valve to inboard tank.	Check defuel valve; refer to 28-2-0 Trouble Shooting.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
11. ONE CROSSFEED VALVE OR ONE LINE SHUTOFF VALVE WILL NOT OPERATE TO OPEN OR CLOSED POSITION ("PRESS-TO-TEST" FEATURE OF BLUE IN-TRANSIT LIGHT DOES NOT FUNCTION)	
A. Defective circuit breaker.	Check for presence of power through corresponding circuit breaker. If no power, replace circuit breaker.
B. Defective wiring between circuit breaker and the light/control switch splice point.	Check for continuity through wiring. If no continuity, repair or replace wiring.
12. ONE CROSSFEED VALVE OR ONE LINE SHUTOFF VALVE WILL NOT OPERATE TO OPEN OR CLOSED POSITION ("PRESS-TO-TEST" FEATURE OF BLUE IN-TRANSIT LIGHT ILLUMINATES LIGHT)	
A. Defective control switch.	Check for continuity through switch, with switch in both positions. If no continuity, replace switch.
B. Defective wiring between light/control switch splice point and valve plug.	Check for continuity from circuit breaker to plug. If no continuity, repair or replace wiring.
C. Defective valve.	Replace valve's motor and gear train.
13. ONE CROSSFEED VALVE OR ONE LINE SHUTOFF VALVE WILL NOT OPERATE TO OPEN OR CLOSED POSITION (BLUE IN-TRANSIT LIGHT REMAINS ILLUMINATED)	
A. Defective valve, or defective wiring.	Check valve's manual index pointer to determine if valve has stopped part way between open and closed position. Check for continuity through wiring between light/control switch splice point and valve. If continuity, replace valve's motor and gear train. If no continuity, repair or replace wiring.
14. EMERGENCY SHUTOFF VALVE WILL NOT OPERATE	
A. Refer to Chapter 26, FIRE PROTECTION for source of trouble.	
15. FUEL TEMPERATURE SYSTEM NOT FUNCTIONING	
A. Refer to Chapter 77, ENGINE INDICATING for source of trouble.	
16. ENGINE FUEL PUMP NOT OPERATING	
A. Refer to Chapter 77, ENGINE INDICATING for source of trouble.	

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
17. LH OR RH AUXILIARY CENTER TANK AND WING CROSSFEED VALVE WILL NOT OPEN OR CLOSE (INTRANSIT LIGHT ILLUMINATES ON "PRESS-TO-TEST")	
A. Loose electrical plug at valve.	Install plug correctly.
B. Defective valve or valve motor.	Replace valve's motor and gear train.
C. Defective wiring between light and control switch, switch and valve, or motor to ground.	Check for continuity through noted wiring. If no continuity, repair or replace wiring.
D. Defective control switch.	Check for continuity through control switch, with switch in both positions. If no continuity, replace switch.
18. RH AND LH AUXILIARY CENTER TANK AND WING CROSSFEED VALVES WILL NOT OPEN OR CLOSE ("PRESS-TO-TEST" FEATURE OF BLUE IN-TRANSIT LIGHTS DOES NOT FUNCTION)	
A. No power in 28-volt dc emergency bus.	Refer to Chapter 24, ELECTRICAL POWER.
B. Defective wiring between circuit breaker and left-hand emergency valve's light control switch splice point.	Check for continuity through noted wiring. If no continuity, repair or replace wiring.
19. ONE AUXILIARY CENTER TANK AND WING CROSSFEED VALVE WILL NOT OPEN	
A. Defective wiring between valve and switch.	Check for continuity through wiring. If no continuity, repair or replace wiring.
B. Defective valve.	Replace valve's motor and gear train.
20. ONE AUXILIARY CENTER TANK AND WING CROSSFEED VALVE WILL NOT CLOSE	
A. Defective wiring between valve and switch.	Check for continuity through wiring. If no continuity, repair or replace wiring.
B. Defective valve.	Replace valve's motor and gear train.
21. RH AND LH AUXILIARY CENTER TANK AND WING CROSSFEED VALVES WILL NOT OPEN	
A. Defective switch.	Check for continuity through switch, with switch in CLOSE position. If no continuity, replace switch.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
21. RH AND LH AUXILIARY CENTER TANK AND WING CROSSFEED VALVES WILL NOT OPEN	
B. Wiring loose at NO terminal of switch.	Check for loose wiring at NO terminal of switch. Install wiring correctly.
22. RH AND LH AUXILIARY CENTER TANK AND WING CROSSFEED VALVES WILL NOT CLOSE	
A. Defective switch.	Check for continuity through switch, with switch in OPEN position. If no continuity, replace switch.
B. Wiring loose at NC terminal of switch.	Check for loose wiring at NC terminal of switch. Install wiring correctly.
23. LINE VALVE, CROSSFEED VALVE, OR AUXILIARY CENTER TANK AND WING CROSSFEED VALVE INTRANSIT LIGHT REMAINS ILLUMINATED EVEN THOUGH VALVE HAS COMPLETED ITS NORMAL TRAVEL	
A. Defective control switch.	Check for continuity through switch, with switch in both positions. If no continuity, replace switch.
24. TANK DRAIN VALVE LEAKS WHEN CLOSED	
A. Defective primary seal.	Replace seal. NOTE: Seal may be replaced without defueling tank.
B. Defective valve.	Replace valve.
25. BOOSTER PUMP THERMAL SWITCH OPENS	
A. Defective pump motor.	Replace pump.
B. Clogged inlet screen, allowing only partial suction.	Check screen at bellmouth for cleanness. Clean screen. Replace pump.
26. BOOST/JETTISON PUMP NOT FUNCTIONING	
A. Refer to 28-5-0, Trouble Shooting.	
27. OUTBOARD ANTI-SHOCK BODY EXCESS FUEL LIGHT NOT FUNCTIONING	
A. Refer to Chapter 31, INSTRUMENTS.	

TRANSFER AND BOOST PUMPS - MAINTENANCE PRACTICES

1. Removal/Installation - Transfer or Boost Pump (see Figure 201)

A. General. Replacement procedures for all boost and transfer pumps are similar. It is not necessary to defuel the airplane; the pump impeller and motor assembly is removed from the underside of the wing or ASB, while the pump housing remains in the fuel tank.

B. Equipment Required. Convair Tool No. 22J 105, or equivalent.

NOTE: If this tool is not available, a satisfactory tool may be fabricated from any long bolt or rod that is threaded 7/16-20 UNF on one end.

C. Prepare for Replacement of Boost or Transfer Pump. Remove electrical power from airplane (refer to Chapter 24, ELECTRICAL POWER) and attach a warning sign to external power connection.

D. Remove Boost or Transfer Pump.

(1) Remove pump access plate from lower surface of wing or ASB.

(2) Remove pump retaining bolt which locks pump to housing.

(3) Using tool No. 22J 105, or equivalent, pull gate lever down to closed position.

(4) Remove drain plug from pump assembly.

WARNING: APPROXIMATELY ONE QUART OF RESIDUAL FUEL WILL DRAIN WHEN PLUG IS REMOVED. PROVIDE SUITABLE CONTAINER; MOP UP SPILLED FUEL IMMEDIATELY.

(5) Screw tool No. 22J 105 into pump assembly at point from which drain plug was removed.

(6) Pull downward with tool until pump assembly is clear of housing; use care to prevent jerking electrical cable.

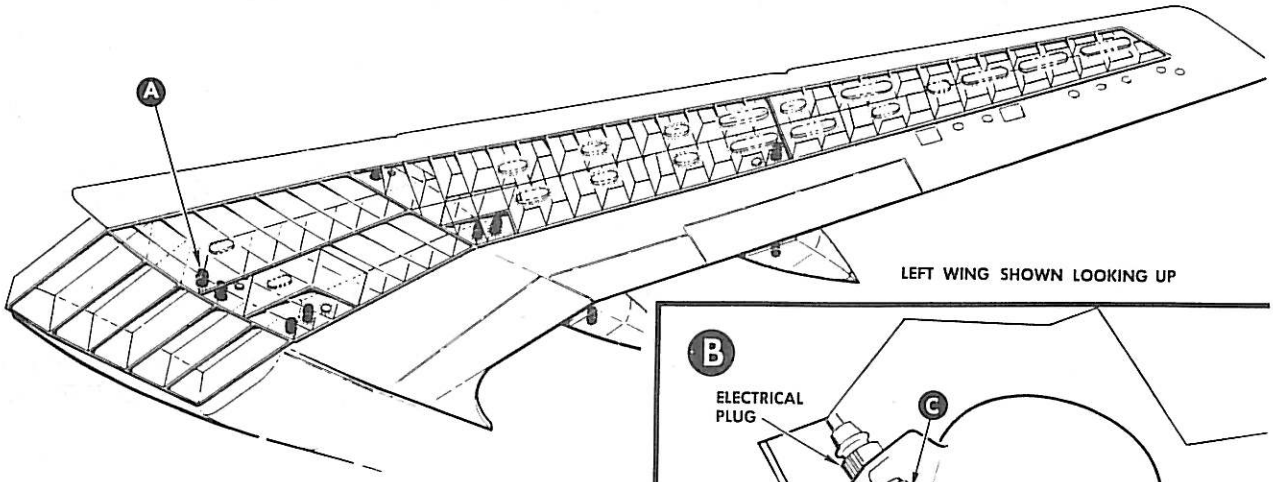
(7) Disconnect electrical plug inside housing by pulling knurled locking sleeve of the plug assembly.

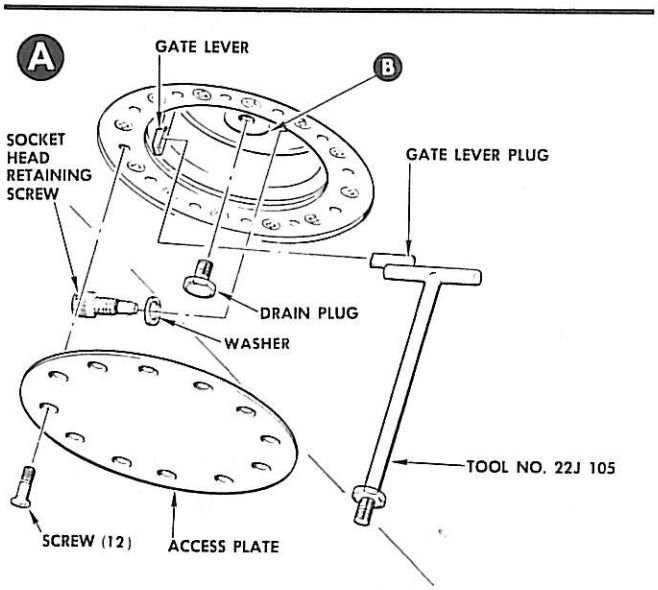
(8) Temporarily replace access plate to prevent foreign matter entering housing.

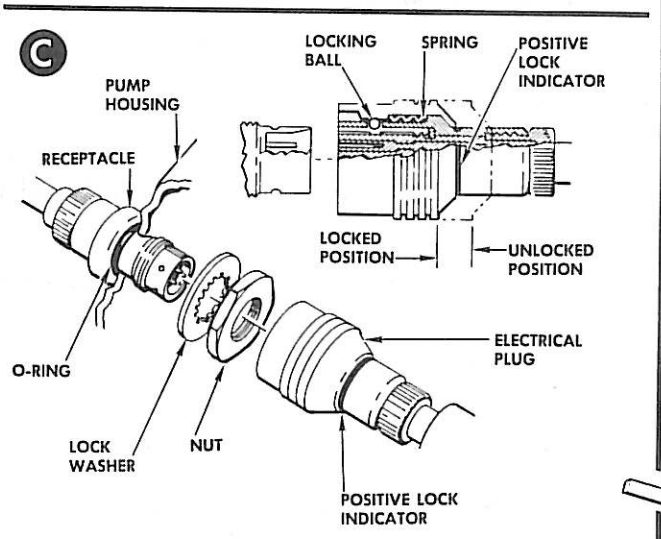
E. Install Boost or Transfer Pump.

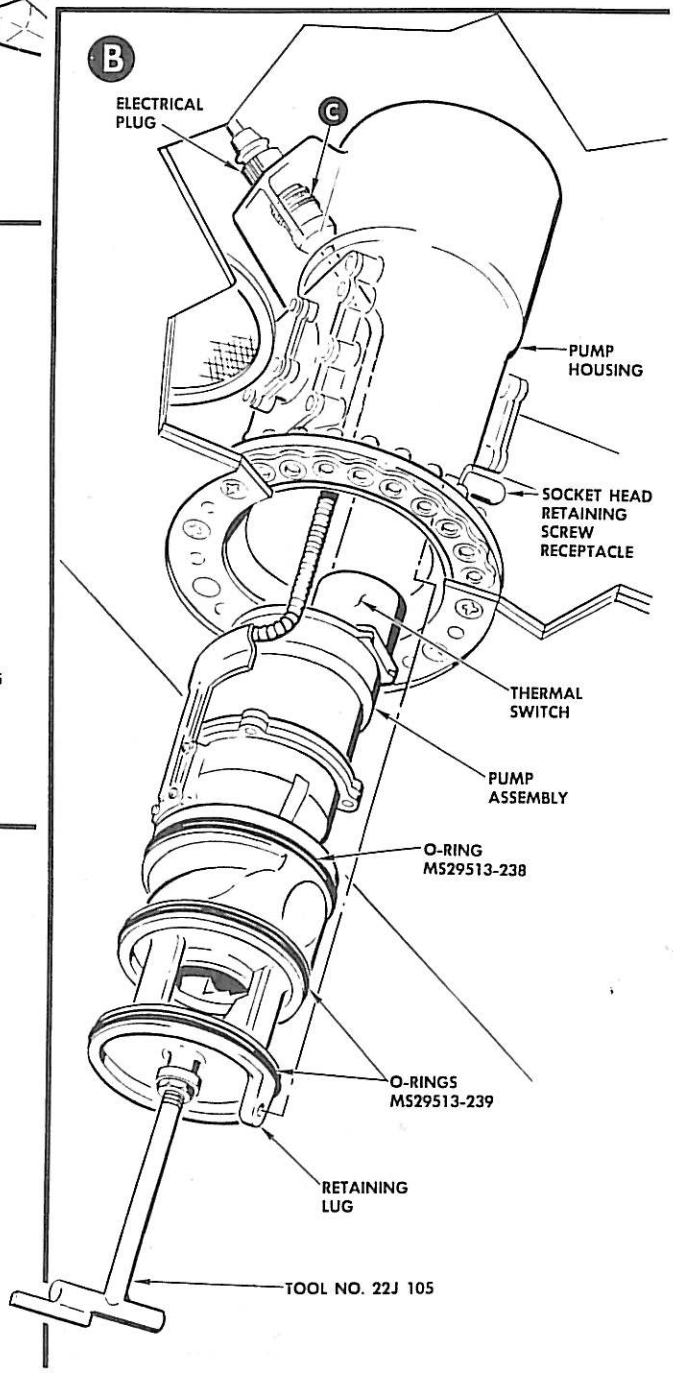
(1) Clean inside of pump housing thoroughly with clean, lint-free cloth.

CAUTION: DO NOT USE SCRAPER WHICH WILL SCORE OR DAMAGE WALL OF HOUSING. DO NOT USE WIRE BRUSH.


A
LEFT WING SHOWN LOOKING UP


A
GATE LEVER
B
SOCKET HEAD RETAINING SCREW
GATE LEVER PLUG
DRAIN PLUG
WASHER
TOOL NO. 22J 105
SCREW (12)
ACCESS PLATE


C
LOCKING BALL
SPRING
POSITIVE LOCK INDICATOR
PUMP HOUSING
RECEPTACLE
LOCKED POSITION
UNLOCKED POSITION
ELECTRICAL PLUG
O-RING
LOCK WASHER
NUT
POSITIVE LOCK INDICATOR


B
ELECTRICAL PLUG
C
PUMP HOUSING
SOCKET HEAD RETAINING SCREW RECEPTACLE
THERMAL SWITCH
PUMP ASSEMBLY
O-RING MS29513-238
O-RINGS MS29513-239
RETAINING LUG
TOOL NO. 22J 105

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(2) Using a mirror and flashlight, check that electrical plug receptacle pins are free of burrs and other mechanical defects, and that retaining nut is tight. If retaining nut is not tight, it will be difficult or impossible to mate plug with receptacle.

(3) Check that electrical plug pin sockets are unobstructed and free of mechanical defects. Check that knurled locking sleeve moves freely and returns to position, exposing red band when released.

(4) Install new O-rings on pump assembly.

(5) Make sure pump assembly is clean, then lubricate exposed surfaces of O-ring with a small amount of petrolatum, Specification VV-P-236, or equivalent.

(6) Position pump assembly horizontally near pump housing opening and rotate it to give maximum cable slack for mating plug with receptacle.

(7) Mate plug with receptacle by pushing the plug body. Do not push the knurled locking sleeve; the sleeve must slide freely to lock properly.

NOTE: Check that plug is in place and locked by pulling lightly on the cable. If plug remains in place, use a mirror and flashlight to check that red band adjacent to knurled locking sleeve is visible, indicating the plug is locked.

(8) After plug is properly connected, allow pump assembly to hang and rotate freely on conduit to eliminate conduit twisting (a conduit twisted more than 360 degrees can cause difficulty in inserting pump into housing). Conduit is designed to take weight of pump assembly without damaging electrical wires.

CAUTION: IF TANK CONTAINS FUEL, MAKE SURE GATE LEVER IS KEPT DOWN IN THE GATE-CLOSED POSITION WHILE INSERTING PUMP ASSEMBLY, TO PREVENT LOSS OF FUEL.

(9) Align retaining lug with screw hole in housing.

(10) Insert pump into housing with cable positioned relative to thermal switch, as shown on detail B of Figure 201. Do not attempt to coil cable around pump at this time.

(11) Push pump up until lower end is approximately flush with wing lower surface. A slight resistance will be felt as pump reaches this position, due to cable crowding top of housing cavity.

(12) Rotate pump approximately 90 degrees counterclockwise; this will snap cable over thermal switch and coil it around pump. Sometimes this will occur during insertion performed in preceding step.

(13) Push pump up all the way and rotate as necessary to align retaining lug with screw hole in housing.

(14) Install socket head retaining screw and drain plug. Safety wire retaining screw to drain plug, using .032 stainless steel wire.

(15) Push gage lever up to the open position.

(16) Clean and install access plate.

(17) Restore electrical power to airplane and remove warning sign.

(18) Operate pump to test; refer to Adjustment/Test - Boost or Transfer Pump Functional Test.

2. Removal/Installation - Transfer or Boost Pump Housing (see Figure 202)

A. General. The replacement procedures are similar for all boost or transfer pump housings.

B. Equipment Required - None.

C. Prepare for Replacement of Pump Housing.

(1) Defuel corresponding wing tank; refer to Chapter 12, SERVICING.

(2) Inert tank; refer to 28-1-0.

D. Remove Fuel Pump Housing.

(1) Remove pump motor assembly; refer to item 1.D.

(2) Disconnect electrical plug and bonding jumper from housing.

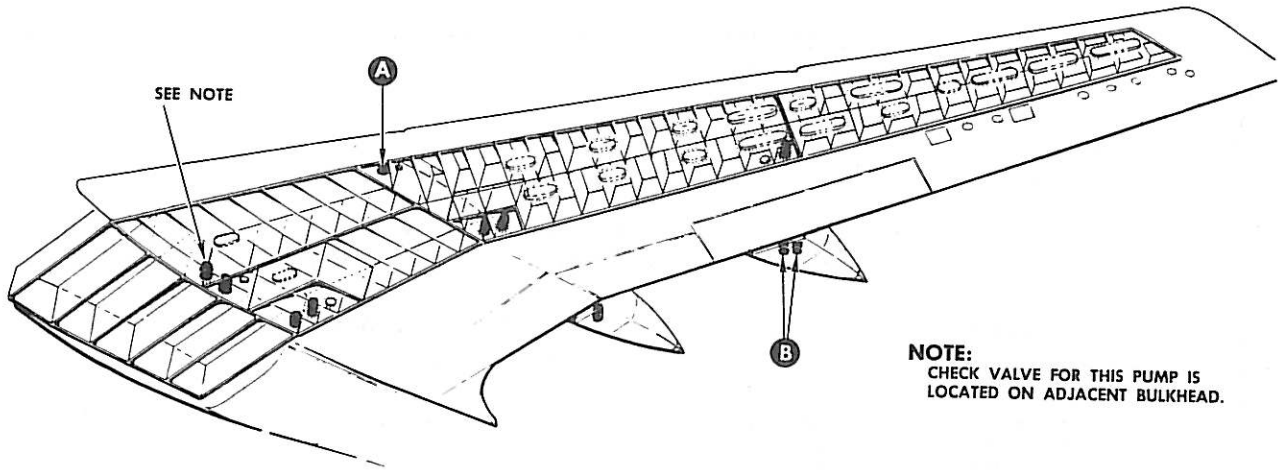
(3) Remove bolts attaching fuel inlet and outlet fittings to housing; (retain seals for installation, if serviceable.)

NOTE: If removing a transfer pump housing in an outboard ASB, retain the restrictor, installed between the fuel outlet fitting and the housing, for installation.

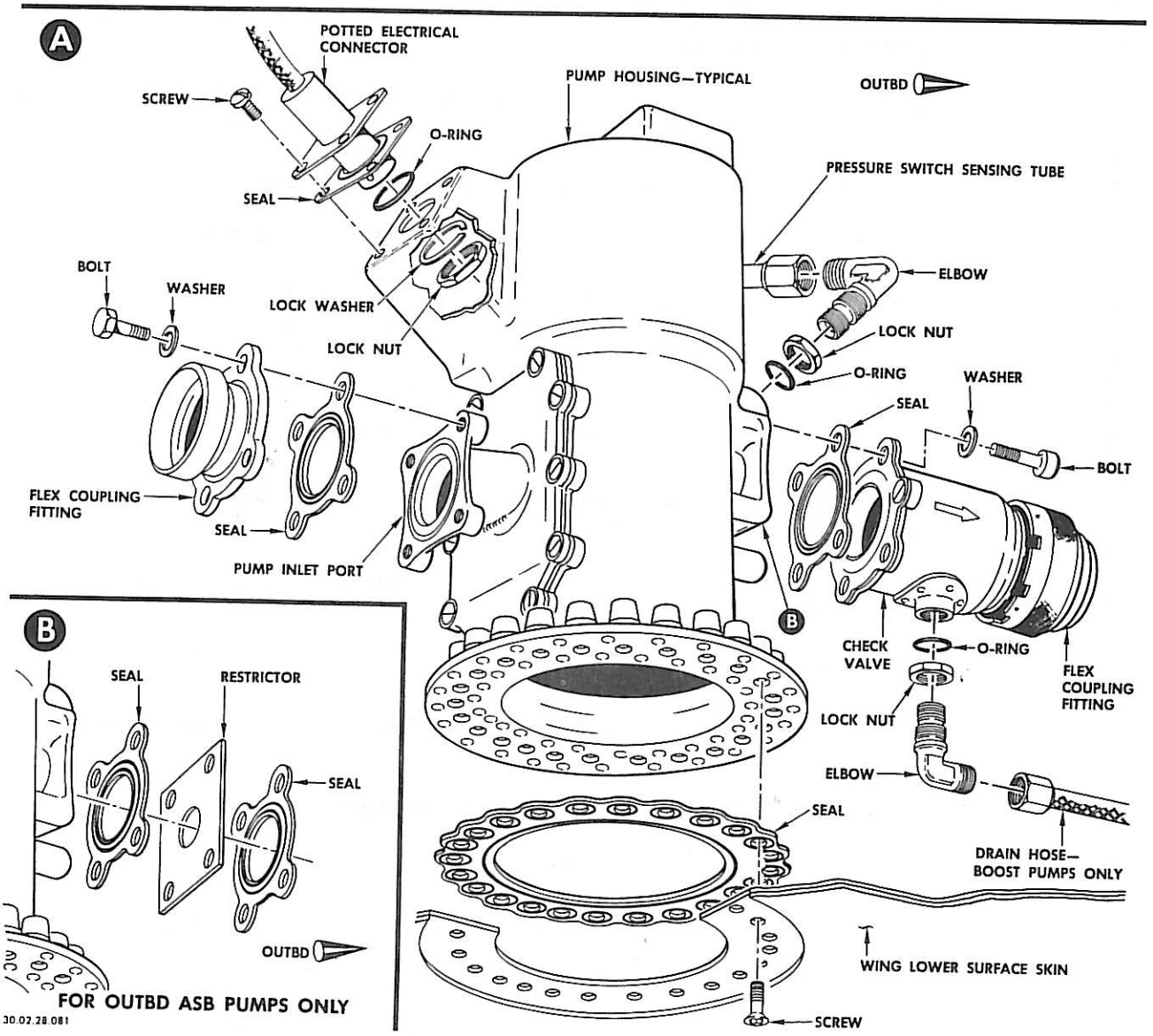
(4) Disconnect fuel low-pressure sensing line from housing.

(5) Remove screws attaching housing to wing lower surface doubler; remove housing. (Retain seal for installation, if serviceable.)

(6) Temporarily replace pump access plate on wing lower surface to prevent foreign matter from entering tank.



LEFT WING SHOWN LOOKING UP



E. Install Fuel Pump Housing.

(1) Make sure mating surfaces of wing lower surface doubler, seal, and pump housing are clean.

(2) Position seal and housing at wing pump opening and install bolts attaching housing to wing skin doubler.

NOTE: Install housing attachment bolts in every other hole; remaining holes will be used to attach pump access plate.

(3) Remove any non-conducting material from jumper and housing mating surfaces, and attach jumper to housing.

(4) Clean mating surfaces of fuel inlet fittings, outlet fittings, seals, and housing.

(5) Position seals and install bolts connecting fuel inlet and outlet fittings to housing.

NOTE: If installing housing in an outboard ASB, install restrictor between fuel outlet fitting and housing.

(6) Connect fuel low pressure sensing line to housing.

(7) Connect electrical plug to housing and install safety wire.

(8) Check pump electrical circuit; refer to item 3, Adjustment/Test - Transfer or Boost Pump Electrical Circuit Check.

(9) Install pump assembly in housing; refer to item 1.E.

(10) Refuel airplane; refer to Chapter 12, SERVICING.

(11) Test pump operation; refer to item 4, Adjustment/Test - Transfer or Boost Pump Functional Test.

3. Adjustment/Test - Transfer or Boost Pump Electrical Circuit Check (see Figure 203)

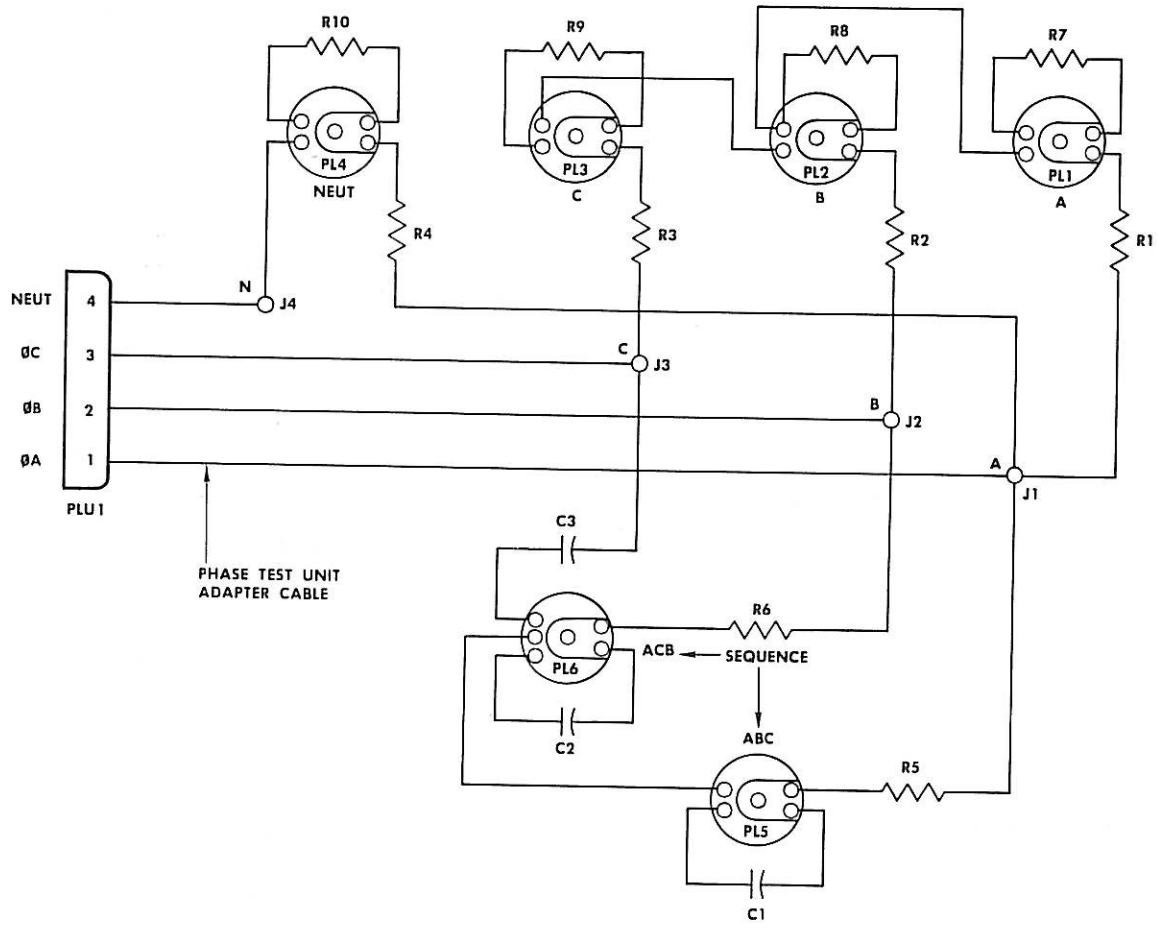
A. Equipment Required.

(1) External source of 115/200-volt, 3-phase, 400 cps, ac electrical power.

(2) Phase test unit per Figure 202, or equivalent.

B. Prepare to Check Electrical Circuit.

(1) Remove applicable boost or transfer pump; refer to item 1.D.



MATERIAL LIST

SYMBOL	DESCRIPTION
PLU 1	CABLE CONNECTOR (TO MATCH RECEPTACLE INSIDE PUMP HOUSING)
C1 AND C2	CAPACITOR, PAPER, .0033 uf, 600-VOLT
C3	CAPACITOR, MICA, .0033 uf, 500-VOLT
R1 THRU R6	RESISTOR, COMPOSITION, 100 K, 5% TOL., 0.5 WATT
R7 THRU R10	RESISTOR, COMPOSITION, 1 MEGOHM, 5% TOL., 0.5 WATT
J1	PHONE-TIP JACK, NYLON-INSULATED-(BLACK)
J2	PHONE-TIP JACK, NYLON-INSULATED-(WHITE)
J3	PHONE-TIP JACK, NYLON-INSULATED-(RED)
J4	PHONE-TIP JACK, NYLON-INSULATED-(GREEN)
CASE	METER CASE, 6¼X3X1-INCHES
PL1 THRU PL6	LAMP HOLDER, T3¼ BULB, CLEAR PLASTIC CAP, WITH NE51 LAMP

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(2) Connect phase test unit adapter cable to electrical receptacle inside pump housing.

(3) Connect external source of electrical power to airplane; refer to Chapter 24, ELECTRICAL POWER.

(4) Close applicable FUEL BOOSTER PUMP or FUEL TRANSFER PUMP circuit breaker on main circuit breaker panel.

C. Check Electrical Circuit.

(1) Place applicable boost or transfer pump switch on flight engineer's panel to the ON position. Phase lights A, B and C on test unit will illuminate with equal brilliance, indicating power on all phases. Left-hand phase sequence light on test unit will illuminate brighter than right phase sequence light, indicating A-B-C rotation.

(2) Place pump switch on flight engineer's panel to the OFF position. Test unit lights will extinguish.

(3) Open circuit breaker closed in step B. (4) and remove electrical Power from airplane.

(4) Disconnect test unit adapter cable from receptacle inside pump housing.

(5) Install pump in housing; refer to item 1.E.

4. Adjustment/Test - Transfer or Boost Pump Functional Test

A. Equipment Required. External source of 115/200-volt, 3-phase, 400 cps ac electrical power.

B. Prepare for Functional Test.

NOTE: This test shall be performed with fuel in tanks.

(1) Close FUEL BOOST PUMP INBOARD CONTROL, FUEL BOOST PUMP OUTBOARD CONTROL, FUEL TRANSFER PUMP CONTROL, FUEL TRANSFER PUMP MAIN CONTROL, FUEL TRANSFER PUMP ANTI-SHOCK BODY CONT, FUEL PUMP INBOARD LOW WARN LTS, and FUEL PUMP OUTBOARD LOW WARN LTS circuit breakers on main circuit breaker panel.

(2) Connect external source of ac electrical power to airplane; refer to Chapter 24, ELECTRICAL POWER.

C. Perform Functional Test.

(1) Actuate No. 1 tank outboard boost pump switch to ON. Listen in the area of the corresponding pump for pump operation sound.

(2) Check that corresponding PUMP LOW PRESS warning light momentarily illuminates, then extinguishes.

(3) Actuate switch to OFF and check that corresponding pump has stopped.

(4) Repeat steps (1) through (3) for remaining boost pumps and for all transfer pumps, substituting switches as required for switch noted in step (1).

(5) Disconnect external electrical power from airplane.

LOW-PRESSURE WARNING SWITCHES - MAINTENANCE PRACTICES

1. Remove/Installation Boost or Transfer Pump Pressure Switch (see Figure 201)

A. Equipment Required - None.

B. Prepare for Replacement of Boost or Transfer Pump Pressure Switch.

(1) Open applicable FUEL PUMP LOW WARN LTS circuit breaker, on main circuit breaker panel. Attach warning tag to circuit breaker.

(2) Open applicable trailing edge access door.

(3) Assure that fuel level in tank is below switch to be removed. Refer to Chapter 12, SERVICING, if necessary to defuel tank to a level below switch.

C. Remove Boost or Transfer Pump Pressure Switch.

(1) Pull gate lever of applicable pump down to closed position.

(2) Disconnect electrical plug from switch. Cover plug and receptacle.

(3) Remove four screws attaching switch to rear spar.

(4) Remove switch by pulling straight aft. Cover rear spar opening from which switch was removed.

D. Install Boost or Transfer Pump Pressure Switch.

CAUTION: THE -1 AND -3 SWITCHES HAVE DIFFERENT PRESSURE SETTINGS. THE INDEX PIN MAKES IT IMPOSSIBLE TO INSTALL THE WRONG SWITCH; HOWEVER, AN ATTEMPT TO INSTALL A -1 SWITCH IN A - 3 LOCATION COULD DAMAGE THE UNIT. THE -1 INDEX PIN IS ON THE LEFT SIDE OF THE VERTICAL CENTER LINE WHEN INSTALLED, AND THE -3 SWITCH INDEX PIN IS ON THE RIGHT SIDE OF THE VERTICAL CENTER LINE.

(1) Make sure pressure port O-ring seal on switch is clean and undamaged, and mating surfaces of switch and flange are clean.

(2) Position switch on mating flange by inserting switch pressure port and index pin into the corresponding receptacles of the mating flange.

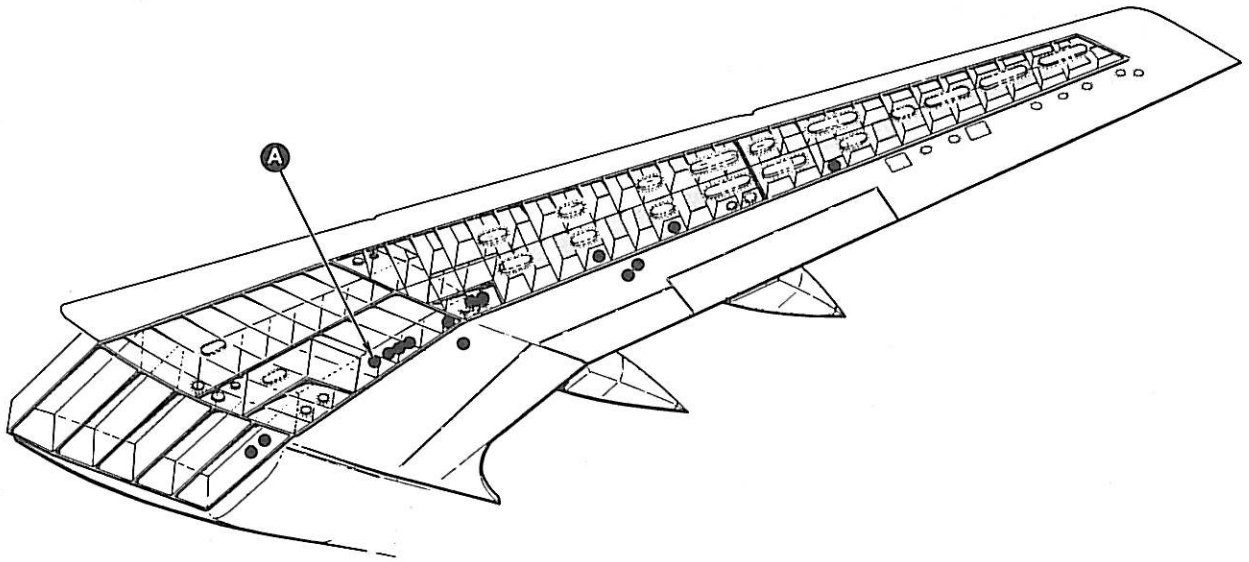
(3) Install four switch attachment screws.

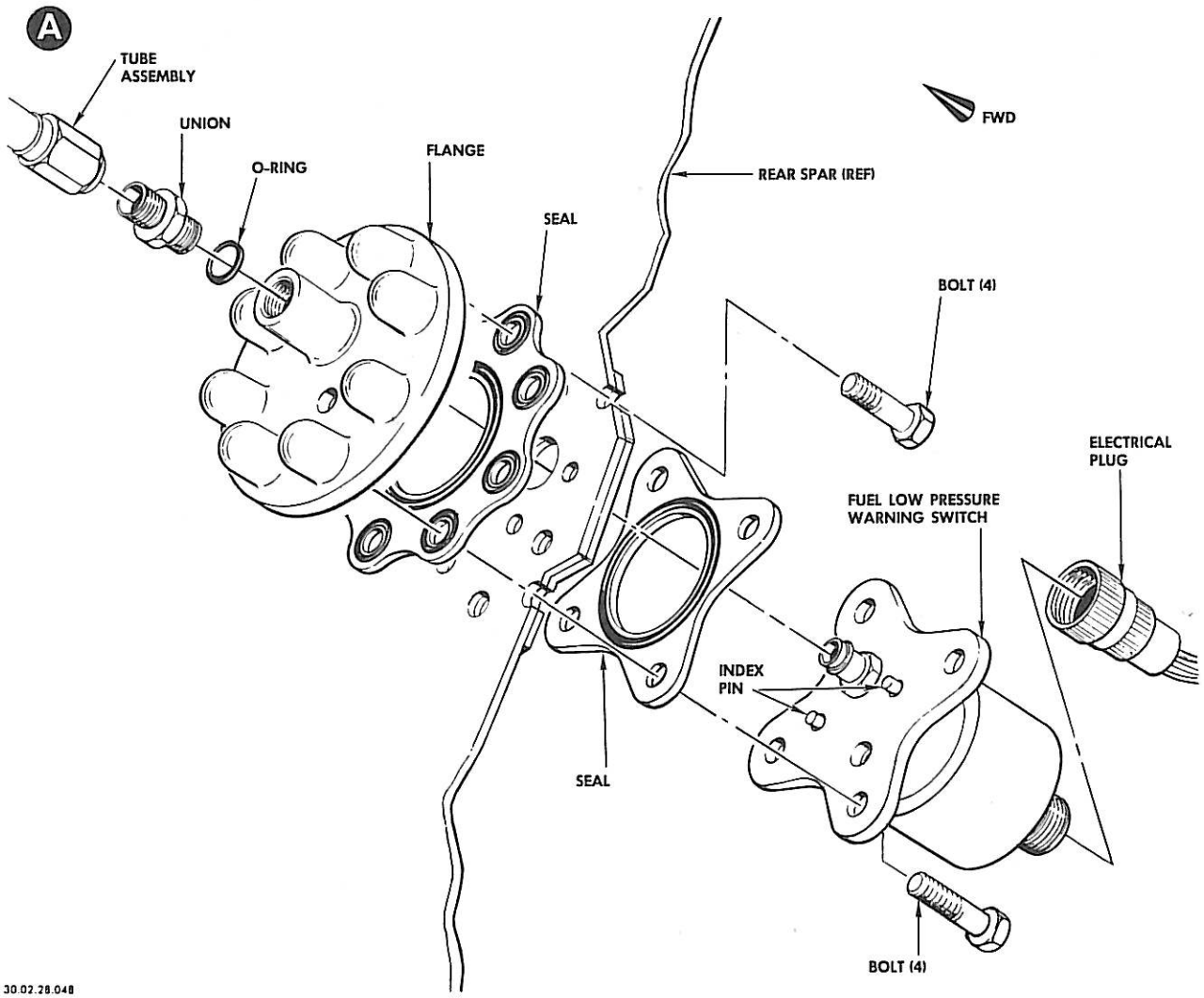
(4) Connect electrical plug to switch.

(5) Push gate lever of applicable pump up to open position.

(6) Remove warning tag and close circuit breaker.

(7) Test switch; refer to Adjustment/Test.





Fuel Low Pressure Warning Switch Installation
Figure 201

2. Adjustment/Test Pump Low-Pressure Warning Switches - Functional Test

A. Equipment Required. Source of 115/200-volt, 3-phase, 400 cps. ac external electrical power.

B. Prepare for Functional Test.

NOTE: Tank containing switch being tested must contain fuel.

(1) Close corresponding FUEL PUMP LOW WARN LTS circuit breaker and corresponding FUEL BOOST PUMP CONTROL or FUEL TRANSFER PUMP CONTROL circuit breaker, on main circuit breaker panel.

(2) Connect source of external ac electrical power to airplane; refer to Chapter 24, ELECTRICAL POWER.

C. Perform Functional Test.

(1) Place switch for corresponding boost or transfer pump in ON position. Corresponding PUMP LOW PRESS warning light will momentarily illuminate, and then extinguish as pump pressure builds up.

NOTE: All boost pump and the No. 1 and No. 4 anti-shock body transfer pump lights extinguish at a pump pressure of 7.0 (±0.5) psig. All other transfer pump lights extinguish at a pump pressure of 2.0 (±0.5) psig.

(2) Place pump switch in OFF position.

(3) Disconnect source of external ac power.

FUEL LINE SHUTOFF VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Fuel Line Shutoff Valve Motor and Sleeve (see Figure 201)

   A. Equipment Required - None.

   B. Prepare for Replacement of Motor and Sleeve. Open and attach warning tag to FUEL LINE VALVE circuit breaker for corresponding tank, on main circuit breaker panel.

   C. Remove Motor and Sleeve Assembly.

      (1) Open trailing edge access door.

      (2) Disconnect electrical plug from valve's motor.

      (3) Unlock sleeve by squeezing two lock levers, rotate motor and sleeve assembly 90 degrees counterclockwise and pull outward to remove. (Discard O-ring.)

      (4) Cover rear spar opening to prevent entrance of foreign matter.

   D. Install Motor and Sleeve Assembly.

      (1) Install new O-ring (MS29513-233) on sleeve assembly. Lubricate O-ring with petrolatum, Specification VV-P-236, or equivalent.

      (2) Position motor and sleeve assembly so that the cam aligns with cut-out in outer sleeve, and index pins align with slots in valve body. Push motor and sleeve assembly in as far as possible and rotate 90 degrees clockwise. Make sure that motor and sleeve assembly is locked in place, with lock levers engaged in slots in valve body.

      (3) Connect electrical plug to motor.

      (4) Close corresponding tank FUEL LINE VALVE circuit breaker(s).

      (5) Test valve; refer to Adjustment/Test.

2. Removal/Installation Fuel Line Shutoff Valve (see Figure 202)

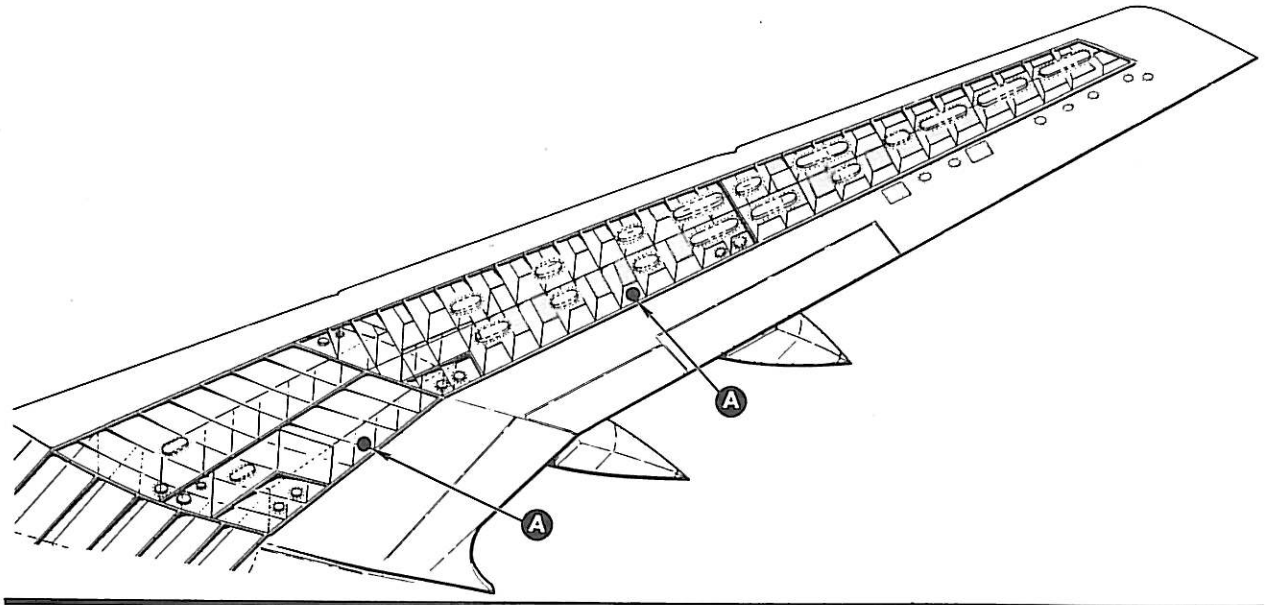
   A. Equipment Required - None.

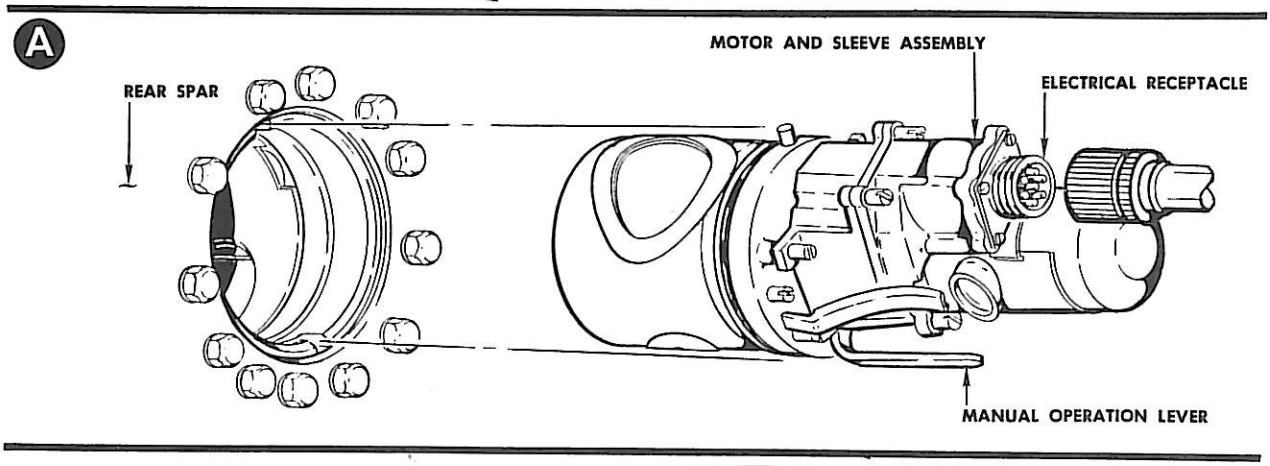
   B. Prepare for Replacement of Valve.

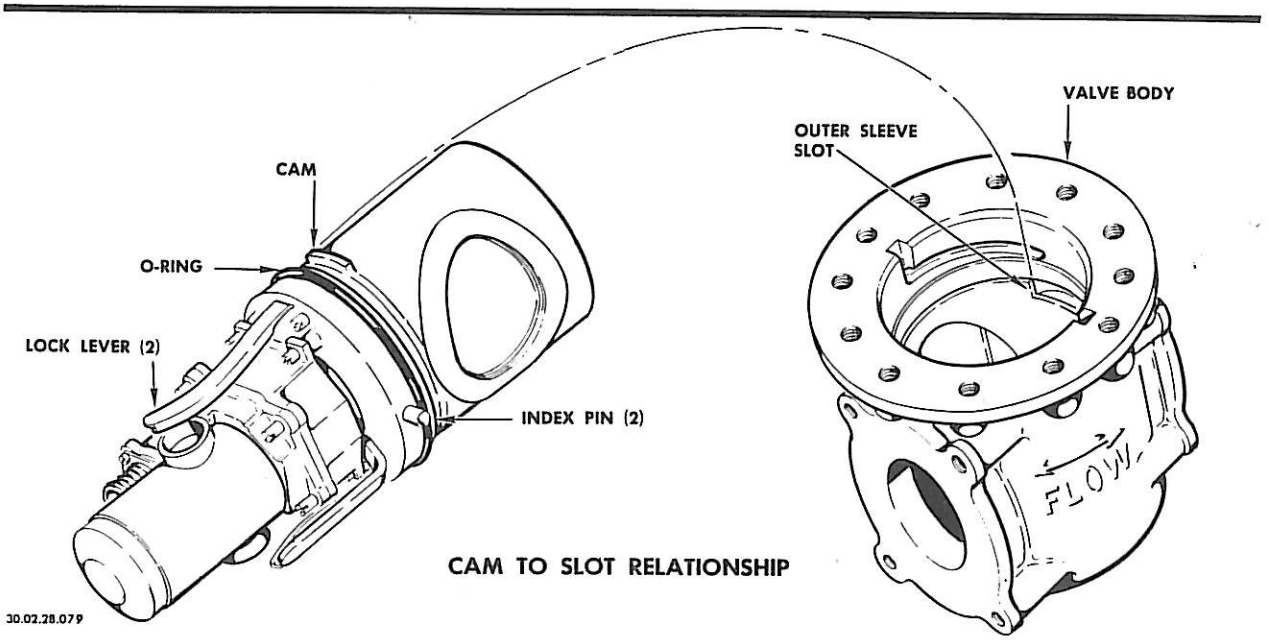
      (1) Defuel corresponding wing tank; refer to Chapter 12, SERVICING.

      (2) Inert tank; refer to 28-1-0.

      WARNING: OBSERVE TANK ENTRANCE PRECAUTIONS; REFER TO 28-1-0;

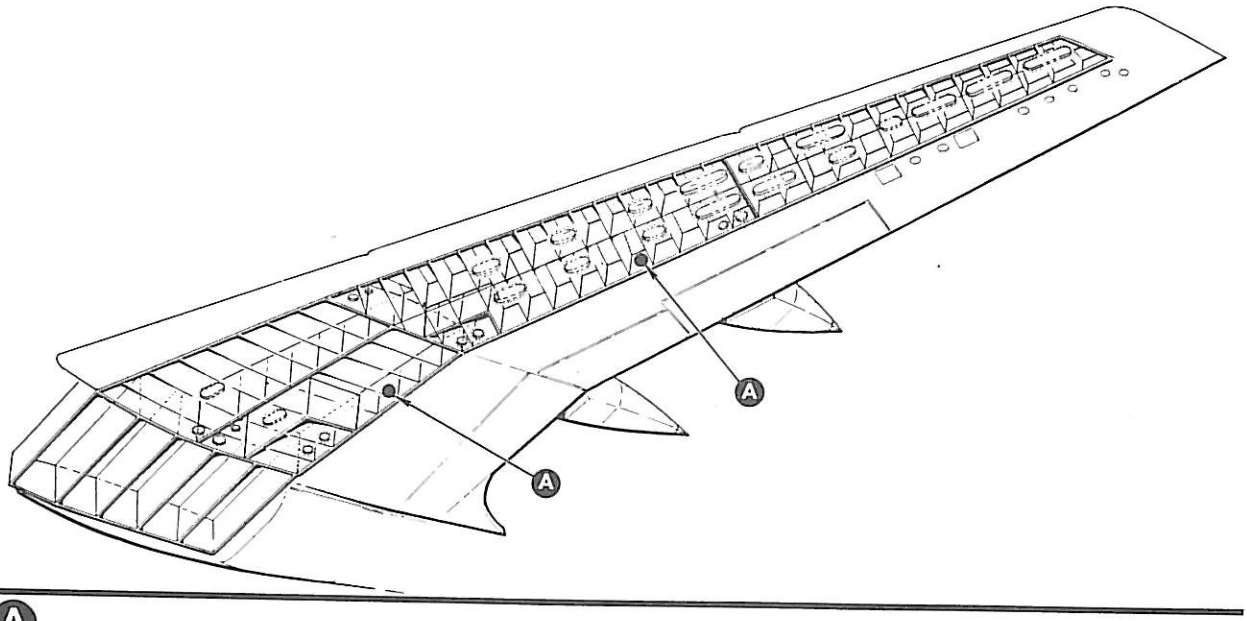


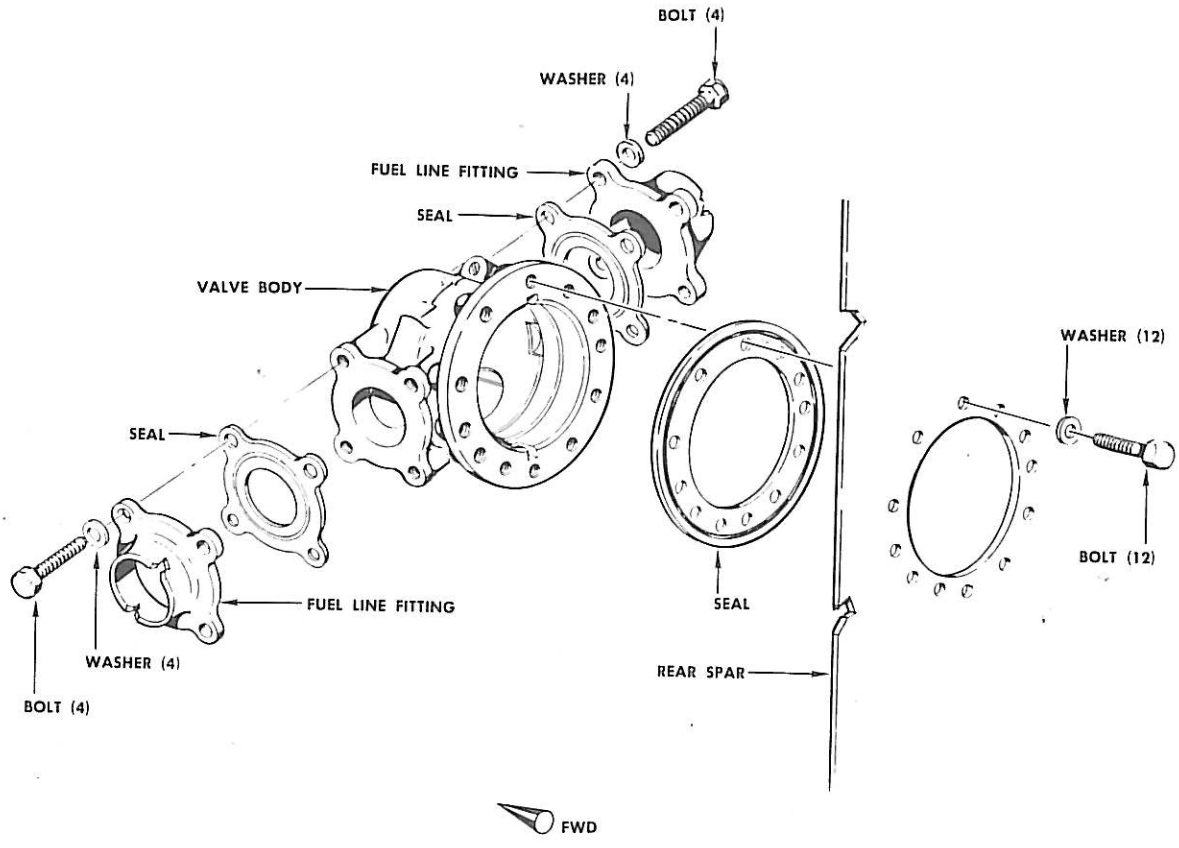




CAM TO SLOT RELATIONSHIP

Fuel Line Shutoff Valve Motor and Sleeve Installation
Figure 201


A
A


A
BOLT (4)
WASHER (4)
FUEL LINE FITTING
SEAL
VALVE BODY
SEAL
FUEL LINE FITTING
WASHER (4)
BOLT (4)
SEAL
REAR SPAR
WASHER (12)
BOLT (12)
FWD

30 02 28 080

C. Remove Valve.

(1) Remove motor and sleeve assembly; refer to item 1.A. through C.

(2) Disconnect line fitting at either side of valve by removing four bolts from each fitting.

(3) Remove 12 bolts attaching valve to rear spar and remove valve. (Retain seal for installation, if serviceable.)

D. Install Valve.

(1) Carefully clean seal, and mating surfaces of valve and rear spar.

(2) Position seal and valve at rear spar and install 12 mounting bolts.

(3) Clean mating surfaces of seals, valve body, and line fittings.

(4) Position seals and line fittings at either side of valve and install bolts.

(5) Install motor and sleeve assembly; refer to item 1.D.

(6) Manually open and close valve to make certain that it operates freely.

(7) Clean tank; refer to 28-1-0.

(8) Refuel tank; refer to Chapter 12, SERVICING.

(9) Test valve; refer to Adjustment/Test.

3. Adjustment/Test Fuel Line Shutoff Valve - Functional Test

A. Equipment Required. External source of 115/200-volt, 3-phase, 400 cps, ac electrical power.

B. Prepare for Functional Test. Connect external source of electrical power to airplane; refer to Chapter 24, ELECTRICAL POWER.

C. Perform Functional Test.

(1) Position corresponding LINE VALVE control knob, on flight engineer's fuel control panel, to the valve open position (control knob line parallel with fuel circuit). Check that blue VALVE IN TRANSIT light illuminates while valve is moving from the closed to the open position, and extinguishes when valve is fully open. Check that manual operation lever on valve moves to the OPEN position.

(2) Position control knob to close the valve (control knob line across the fuel circuit). Check that VALVE IN TRANSIT light illuminates while valve is in transit, and that it extinguishes when valve is fully closed. Check that manual operation lever on valve moves to the CLOSED position.

(3) Remove external electrical power from airplane; refer to Chapter 24, ELECTRICAL POWER.